May 1928

Electrical Manufacturing

Vol. 1 A Gage Publication No. 2

The Thrust-Radial Electric Motors

Bearing durability is the critical factor in motor costs. Radical savings are certain with bearings which overcome not only the wear of friction and radial load, *but of thrust and shock as well.* That is exactly what Timken Bearings do, because they have the extreme thrust-radial capacity made possible only by Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken electric steel.

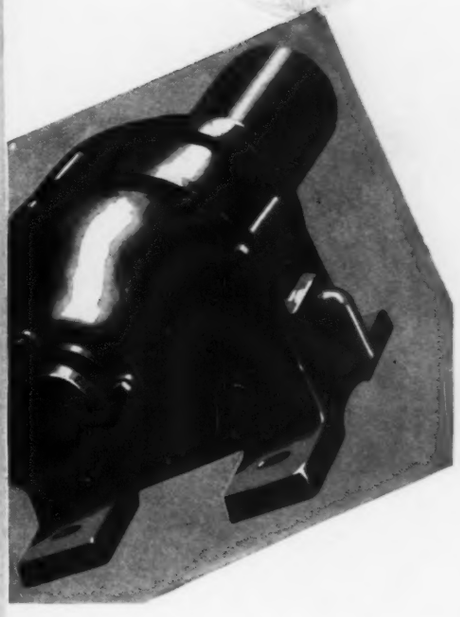
Full thrust-radial capacity means invincible endurance—the endurance which has brought all Industry to Timkens—which makes anti-friction economies practical for the million-pound loads of cement mills or steel mills—which preserves the micrometer accuracy of machine tool spindles—which is speeding output and slashing depreciation charges in every type of industrial equipment.

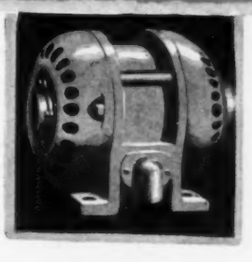
Timken thrust-radial capacity in motors makes them equally efficient operating on floor, wall or ceiling. It makes them equally wear-proof with any type of drive. It permits the compact mountings that save space, shorten shafts, increase rigidity and improve ventilation.

With nothing more than a negligible amount of lubrication Timken-equipped motors are kept like new. Abrasion and burn-outs are warded off permanently. There is no leakage or dripping to soak the windings or damage the product. And acceleration is faster, but non-destructive.

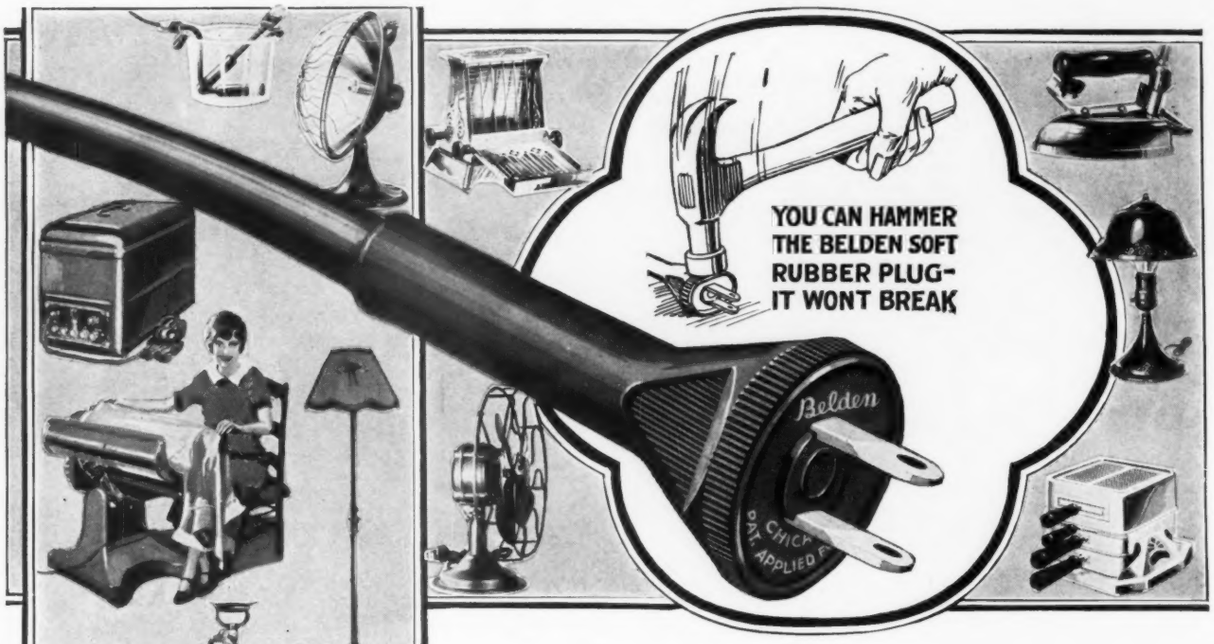
Timken Bearings are forcing costs to their lowest levels in motors, as in practically every type of equipment throughout all Industry. The records of thousands of Timken-equipped motors are conclusive. Specify Timken Bearings for the heavy duty jobs that once were "death to motors." Specify Timken Bearings for any motor you order. Any motor manufacturer will build them in for you.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO





TIMKEN
Tapered
ROLLER BEARINGS



A New Soft Rubber Plug That Cannot Break

An Exclusive Feature of Belden Cut Cord Service

The Belden Soft Rubber Plug completely eliminates complaints from broken plugs. No service is too hard, no treatment too severe for this remarkable Belden Plug. If the receptacle is not of exactly the right size, the prongs spread or draw together without damaging the plug.

You can drop the Belden Soft Rubber Plug or even throw it on the floor without breaking it.

The Belden Soft Rubber Plug is a complete unit molded in Belden factories. It is assembled on Belden Wire as an *exclusive feature* of Belden Cut Cord Service.

Many leading appliance manufacturers are taking advantage of this remarkable plug. Write for free samples today. Be sure to specify service for which sample is desired.

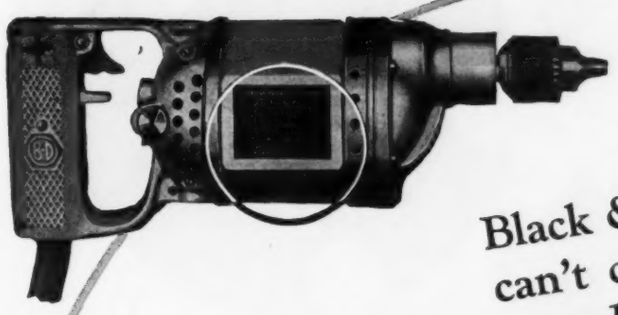
BELDEN PRODUCTS

Beldenamel and Textile Magnet Wire
Coil Windings
Beldenmold (Molded Bakelite Products)
Automotive Wires and Cables
Airplane Assemblies
Radio Wires, Cords and Cables
Rubber Covered Wires
Armored Cables
Flexible Armature Wires
Motor Lead Wires
Braided and Stranded Copper Cables
Cotton Sleeving

Belden Manufacturing Company

2310B South Western Avenue **Chicago, Illinois**

Specify Belden

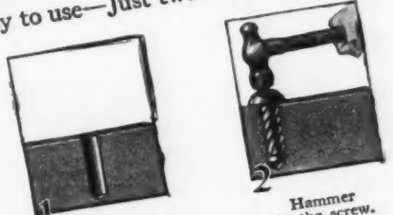


Black & Decker name plates can't come off — They're fastened with Hardened Metallic Drive Screws

NAME Plates are attached to all Black & Decker products with PARKER-KALON Hardened Metallic DRIVE SCREWS because they found that these Screws are easier and cheaper to use—that they made better fastenings—and speed up production.

Hardened Metallic Drive Screws are so threaded and hardened that they cut their own thread in iron, brass and aluminum castings, steel Bakelite, etc. as they are hammered into the material. They eliminate the costly tapping operation with its breakage of taps and upkeep of tapping machinery. Furthermore, they make better fastenings than machine screws, escutcheon pins, etc.—fastenings that will not loosen even under extreme vibration.

Easy to use—Just two simple operations.



1 Drill a hole.

2 Hammer in the screw.

More than 18,000 manufacturers, in every branch of the metal working industry, are using these Screws for hundreds of different applications, from attaching name plates to making assemblies where the strength of the fastening is an important consideration. It will pay you to look into their time-and-labor saving possibilities.

PARKER-KALON CORPORATION
190-204 Varick Street, New York, N. Y.

Distributed in Canada by
Aikenhead H'dware., Ltd., 19-21 Temperance St., Toronto

Parker-Kalon
TRADE MARK
Hardened Metallic
REG. U.S. PAT. OFF.
Drive Screws

PATENTED JAN. 29, 1924 - No. 1482181
OTHERS PENDING

Send for FREE Samples

Just tell us what you want to fasten and we shall be glad to send samples together with complete information.

New Stock That Works Better!

IMPORTANT developments in raw material for the manufacture of Formica have resulted recently in some striking improvements.

Formica punching stock of today is better electrically than the high di-electric material of a few years ago—and it punches better than anything that has ever been available before!

More progress has been made in improving Formica in the last eight months than for years previously.

Tell us the nature of the work you want your Laminated Insulating material to do and how you intend to fabricate it and let us recommend the material.

Or send your blueprints of punched and fabricated parts for a price.

THE FORMICA INSULATION CO.
4638 Spring Grove Avenue
CINCINNATI, OHIO

FORMICA
Made from Anhydrous Bakelite Resins
SHEETS TUBES RODS

Electrical Manufacturing

Reg. U. S. Patent Office

• Production • Marketing • Administration • Repairing •

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Great Possibilities Lie Before Us

THE electrical industry is never finished. Just as new architecture has reared, on a startling scale, the towers of today, so the electrical industry has been developed by its architects until it approaches epic proportions. The end of electrical development is not even remotely visible. Electrical scientists recognize absolutely no boundary, no limitation, in the opportunity for service presented by the future. The amazing developments which have been achieved, far from exhausting our creative ingenuity, ought rather to suggest the enormous possibilities which lie before us, and fill us with a fresh zeal for their realization. The solid achievements of former generations were due to the foresight and devotion of the young men of the past: the boundless future is in the hands of the young men of today.

Owen D. Young

—Owen D. Young in "A Century of Industrial Progress."

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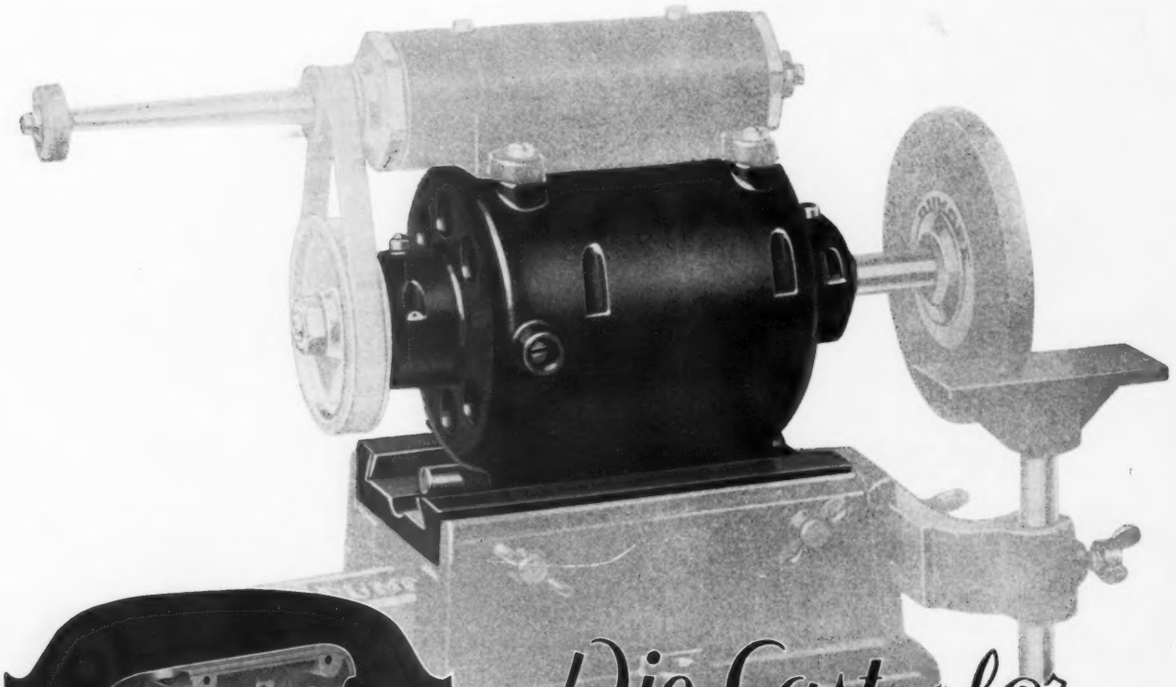
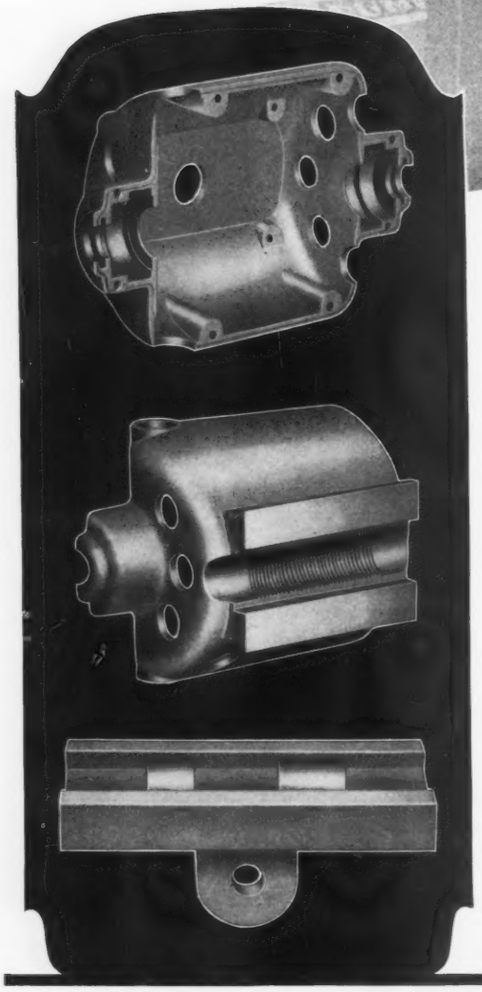




Die Cast - for Precision at Low Cost

DUMORE Grinders are in daily use in thousands of tool rooms and machine shops in all types of industry. Yet, few factory executives realize that this popular precision machine owes much of its efficiency, economy and versatility to certain die cast units.

The threaded base slide and both halves of the motor housing are die cast nearly 100% ready for assembly—resulting in a precision machine of moderate price, a decided sales advantage.

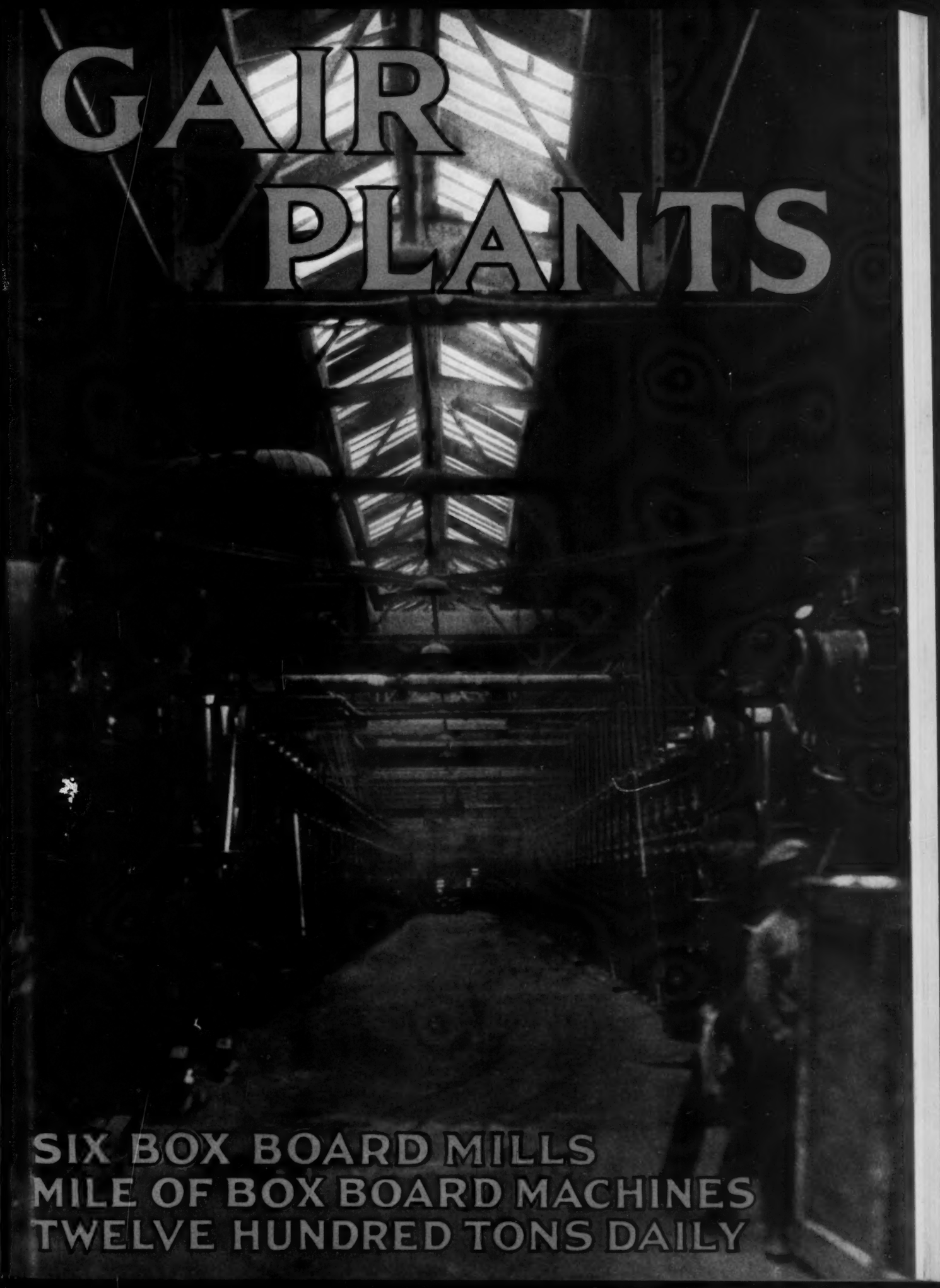
The Wisconsin Electric Company lists the benefits of having these parts die cast as follows:

1. Interchangeability without machining.
2. High production in casting and assembling.
3. Low production cost.
4. Uniformity of metal and fine surface assures adequate strength and eliminates much polishing.

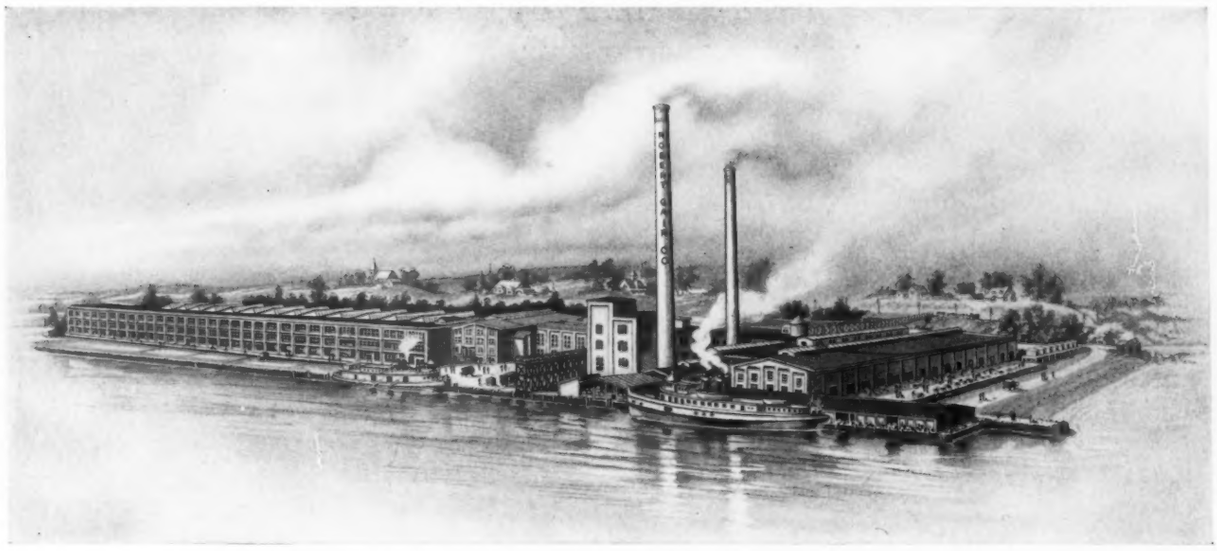
These advantages are the result of careful analysis of the parts involved by Milwaukee Die Casting Technicians working in close harmony with the customer's engineering staff. Perhaps such an analysis would indicate that parts of your product could be die cast with equally gratifying results.

MILWAUKEE DIE CASTING CO.
289 FOURTH STREET MILWAUKEE, WIS.

MILWAUKEE DIE CASTINGS AND BEARINGS


GAIR
PLANTS
SIX BOX BOARD MILLS
MILE OF BOX BOARD MACHINES
TWELVE HUNDRED TONS DAILY

GAIR CASES



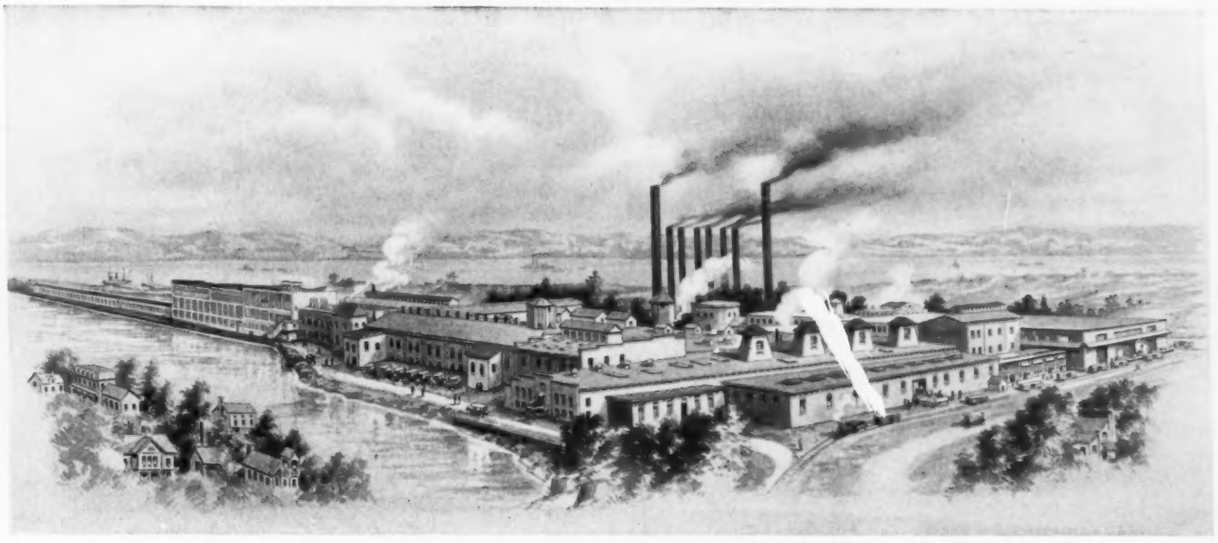
Thames River Corrugated Case Division, New London, Conn.

PLANS, Plants and the "Spirit of the Hive" produce Quality, Service and Economy, a three-word creed that is spread on the walls of our departments in letters a foot high. Customers can't see them, but they are visible in the goods they get from an organization with the Quality habit.

Corrugated Cases may be as resilient (beloved word of corrugated terminology) as a mattress but like one, buckle under top pressure. Gair Jute Liner, however, is made to resemble the toughness of leather and to have the sustaining stiffness of box board—something between, that will resist knocks and thumps and stand rigid when the Cases it armors are stacked a good height.

Corrugated Cases look alike, but there are fingerprint variations in these heavy-duty goods that the Chemist, with his eye to the microscope, detects. Every buyer cannot have a microscope to catch the meaning of the lay and the length of the little fibres in the Jute, nor note the character of the cellulose in the straw, nor can he have a ripping instrument to test the resistance of the tape that joins the Case. By these things, the Chemist knows whether the Corrugated Case will endure ten miles or ten thousand. The unfinished Material and the completed Corrugated Case and Solid Fibre Container begin and end in the Gair Laboratories for test and check of quality and uniformity.

CORRUGATED & SOLID FIBRE



Piermont Fibre Container and Carton Division, Piermont, N. Y.

GAIR Corrugated Cases and Solid Fibre Containers are the products of two huge, centralized, self-contained plants, together more than three quarters of a mile in length. *There is one executive control, one formula for uniformity and one method of manufacture on standardized machinery.* These two units, one specializing in Corrugated Cases and the other in Solid Fibre Containers, are organized and equipped to the peak of efficiency. They concentrate on economical production, but not on cheapening the goods. The saving is one that comes from the fullness of the best mechanical energy and its intelligent direction. Our Production Manager does not take it out of the goods. He threw out the plant whistle that signalled start-up and shut-down and put in an electric siren to save the cost of pressure steam, a detail of saving which ramifies the whole manufacturing scheme. *There is no multiplication of effort or duplication of processes.* The last operation on Corrugated Cases and Solid Fibre Containers is performed within five hundred feet of the dry end of the paper-making machines and then to the Cars.

The Thames River Corrugated Division has a Branch Plant in Greater New York. They work hand in glove in the interest of Metropolitan service and the emergency requirements of our customers. Corrugated Cases shipped from the New London, Conn. Plant and Solid Fibre Containers forwarded from the Piermont, N. Y. Plant move over logical marine and railroad lines radiating East, West and to the points South shown in the map

Six Box Board Mills. 1200 tons daily

Container and Carton Sales Offices:

NEW YORK CITY
Robert Gair Company
Graybar Bldg.
420 Lexington Ave.

BOSTON, MASS.
Arthur J. Wallace
Rice Bldg.
No. 10 High St.

PHILADELPHIA, PA.
Edward E. Seaver
Liberty Trust Bldg.
Broad & Arch Sts.

BUFFALO, N. Y.
H. D. Rice
Crosby Bldg.
Franklin & Mohawk Sts.

CHICAGO, ILL.
C. C. Emerson
Builders' Bldg.
No. 228 No. La Salle St.

BALTIMORE, MD.
Brent Farber
Gunther Bldg.

SAN FRANCISCO, CAL.
W. D. Brooks
Monadnock Bldg.

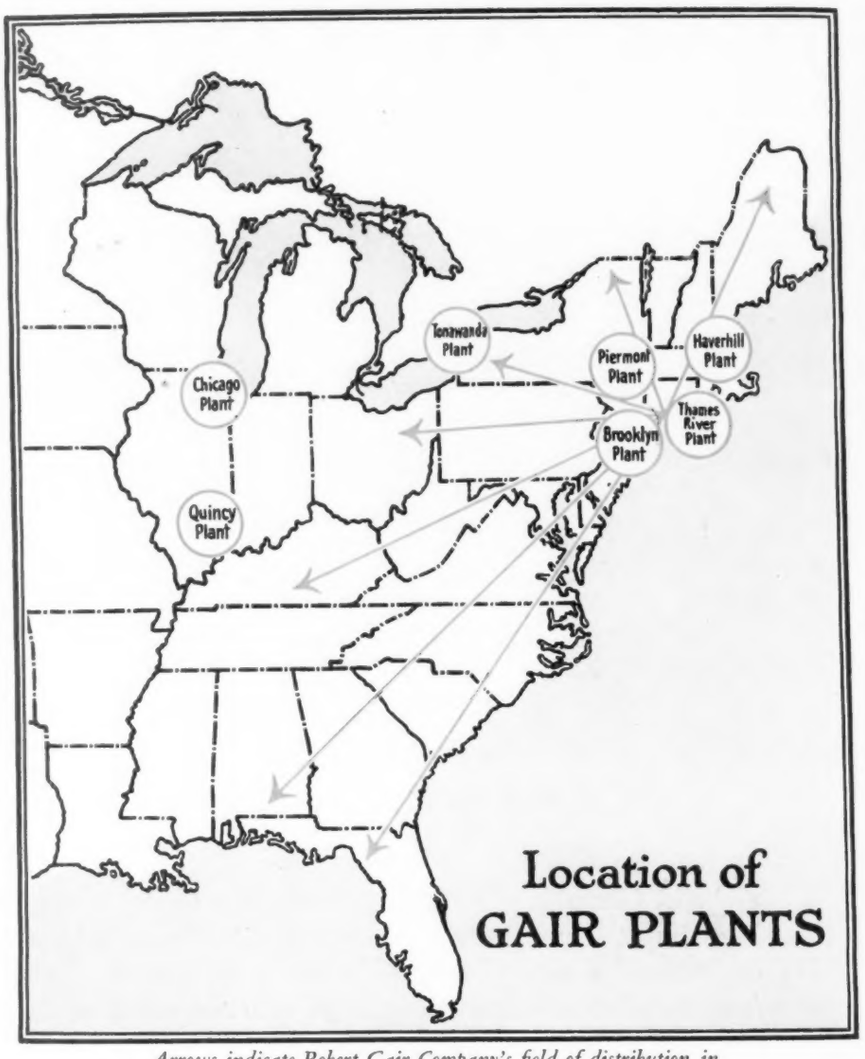
Box Board Sales Offices:

NEW YORK CITY
H. Whitmore
Robert Gair Company
Graybar Bldg.
420 Lexington Ave.

CHICAGO, ILL.
F. D. Wilson
Builders' Bldg.
No. 228 No. La Salle St.

TONAWANDA, N. Y.
Robert Bursch
Robert Gair Company
Tonawanda Division

BOSTON, MASS.
Fred Morrison
Charles Chauncy Bldg.
No. 38 Chauncy St.



Arrows indicate Robert Gair Company's field of distribution in Corrugated Cases and Fibre Containers

DISTRIBUTION

THIS map shows the area of distribution of Corrugated Cases from the Thames River Division, New London, Conn., and of Solid Fibre Containers from the Piermont Division at Piermont, N. Y.

Gair Mills at Haverhill, Mass., Tonawanda, N. Y., Chicago, Ill., and Quincy, Ill., concentrate upon Box Board Products. If all Gair paper-making machines were battalioned single file, they would trail over about a mile. Altogether, they are equal to an output of somewhat more than twelve hundred tons daily.

PACKAGERY ENGINEERS

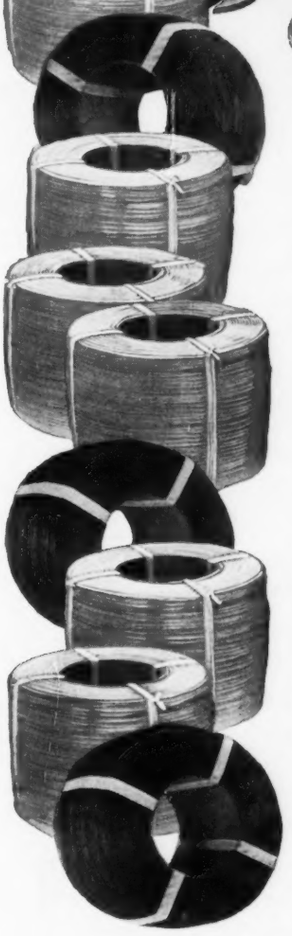
GAIR consultants are trained in packing-room principles. Some have had mill experience; all are students of their business. Notice to the General Office in New York or any of the Company's Branch Offices will be answered by them quickly and with the earnest purpose of making their visit resultful to you.

These Consulting Engineers are supported by J. D. Malcolmson, graduate of the University of Kansas in Chemical Industrial Engineering and former Fellow of the Mellon Institute of Industrial Research of the University of Pittsburgh. He is an authority on legal regulations and manufacturing technique. He is in charge of research and of special construction in our Department of Design.

ROBERT GAIR COMPANY

GRAYBAR BLDG., 420 LEXINGTON AVE., NEW YORK CITY

WHY SHIP SPOOLS BACK and FORTH ?



Tons of Wire and only One Spool

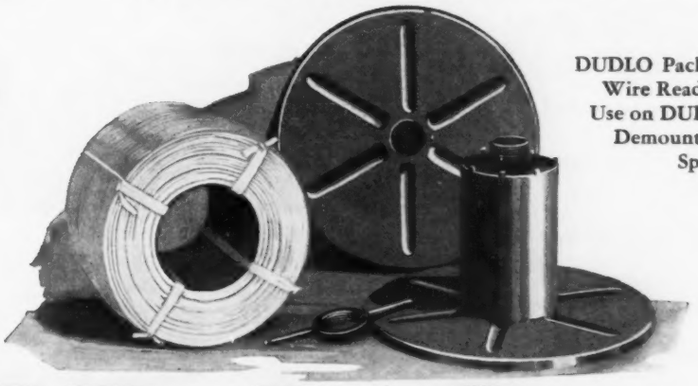
Eliminating Spools Means Saving One Load in Five

The shipping of wire on spools with its excessive tare and the handling and return of empty spools has continued unquestioned as a necessary evil.

But DUDLO engineers, alert for economies and improvements have demonstrated that shipping spools is unnecessary—that wire properly spooled at the mill can be tied, removed from the spools, and shipped in condition for perfect unspooling by the customer through the use of the "Dudlo Demountable Spool".

Here are some of the benefits of purchasing Dudlo wire in this new money-saving form.

Release capital tied up in spools.
Cut handling costs by reducing bulk weight.
Save storage space used for empty spools.
Eliminate packing of empty spools for return.
Save freight paid on return of empties.
Eliminate cost of spool breakage.
Save clerical cost of handling spool debits and credits.



DUDLO Package Wire Ready to Use on DUDLO Demountable Spools

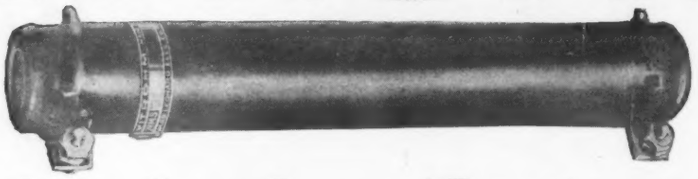
DUDLO

DUDLO MANUFACTURING COMPANY, FORT WAYNE, INDIANA

56 EARL ST. NEWARK, N. J. | 160 N. LA SALLE ST. CHICAGO, ILL. | Divison of THE GENERAL CABLE CORPORATION | 274 BRANNAN ST. SAN FRANCISCO, CAL. | 4153 BINGHAM AVE. ST. LOUIS, MO.

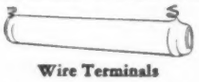
VITROHM RESISTORS · · · IN EVERY INDUSTRY · · · IN EVERY LAND

VITROHM

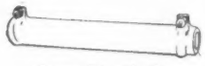


Is the Mark of an Engineering and Production Service

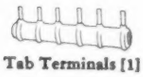
TERMINALS & MOUNTINGS



Wire Terminals



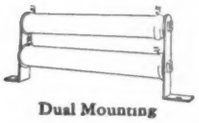
Screw Terminals



Tab Terminals [1]

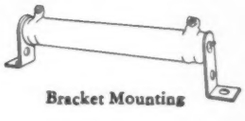
Tab Terminals [2]

Ferrule Terminals



Dual Mounting

Cage Mounting



Bracket Mounting

Plug-Receptacle Mounting

These illustrations show some of the standard terminals and mountings for Vitrohm Resistors. Bulletin 63 gives full descriptions.

VITROHM RESISTORS* have not, like Topsy, just "g r o w e d." They represent a logical and carefully engineered product developed from the first vitreous enamelled resistors made by WARD LEONARD some 36 years ago.

WARD LEONARD first manufactured the VITROHM RESISTOR in successful answer to the demand for a resistor to be permanently accurate while dissipating more energy than was possible with existing types of bare-wire, composition-covered and carbon resistors.

During these past 36 years, WARD LEONARD has learned a great deal concerning vitreous enamelled resistor units. We learned, for example, that the specific application of a resistor frequently limits its design.

In our development files is listed the design data of more than 46,000 resistors. This data covers resistors for use with every type of electrical device, from generators of the nineties to the radio power pack of today.

This knowledge, including as it does, a wide research and production experience, is yours the moment your specification for a resistor reaches us.

Bulletin 63, sent w i t h o u t charge, describes standard VITROHM RESISTORS. A post card will bring it.

**Vitrohm Resistors:*

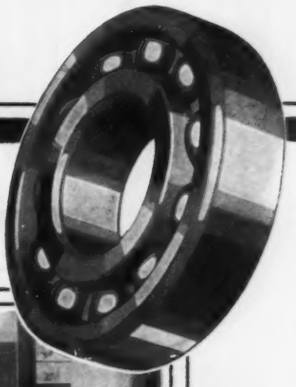
Made by winding a special resistance wire upon a refractory base. The resistive element and terminal connections are then completely enclosed and permanently protected by fused-on vitreous enamel. This enamel, which is exclusively WARD LEONARD'S, assures rapid conduction of heat from the resistive element to the air and permits h i g h dissipation of power without overheating or injuring the unit.

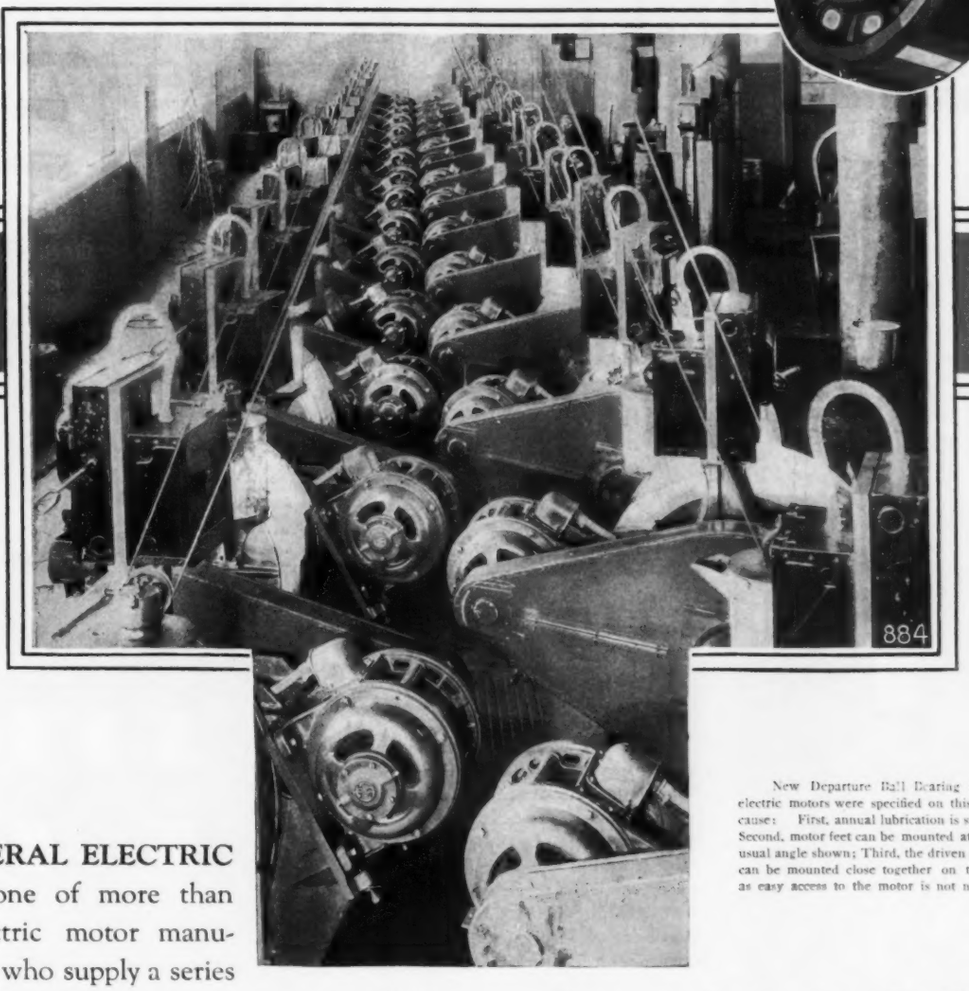
WARD LEONARD ELECTRIC CO.

MOUNT VERNON, NEW YORK

38-30-26.

You can get 'em from the leading motor manufacturers





New Departure Ball Bearing equipped electric motors were specified on this job because: First, annual lubrication is sufficient; Second, motor feet can be mounted at the unusual angle shown; Third, the driven machines can be mounted close together on the floor, as easy access to the motor is not necessary.

GENERAL ELECTRIC is one of more than fifty electric motor manufacturers who supply a series of general purpose electric motors with ball bearings as standard or optional equipment.

Low maintenance costs and long bearing life are only two of the vital reasons why electric motors should have New Departure Ball Bearings. Additional reasons are fully described in two booklets published by the Engineering Department. "Booklet K" is of interest to designers. "Cutting Your Costs" is of interest to owners, operators and maintenance men. Either or both sent upon request.

The New Departure Manufacturing Company, Bristol, Connecticut; Detroit, Chicago and San Francisco.

NATIONAL
VULCANIZED
FIBRE
SHEETS · RODS · TUBES · SHAPES
FOR BUSY INDUSTRIES
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Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 1 MAY - 1928 Number 2

YOUTH *Springs* a NEW IDEA

By Stanley A. Dennis
Editor, Electrical Manufacturing

SUPPOSE that on one of these fine spring mornings a young man employed in your department steps eagerly into your office, and in a voice tense with enthusiasm and with a countenance that reveals his mind in possession of a new discovery, announces to you:

"Good morning, sir. Overnight I have thought out a way of redesigning our latest model so as to cut down the cost of material used at least 30 per cent!"

Or suppose he says:

"I've worked out a new plan for handling our territories so that we can cover our customers more frequently and with fewer salesmen."

Or suppose it is:

"May I suggest a way of rearranging our general office that will save us a substantial amount in rent?"

Well, what will you do about it? Something must always be done when youth springs a new idea. A new idea may be worth nothing, or it may be worth untold thousands of dollars to you and your business. And when all else is said and done, ideas are the very life of your business.

Photo by Underwood & Underwood

Sound business management suggests certain definite things to do when youth rushes in with its new idea, which may prove to be either a wild dream or a vision of infinite possibilities.

First, do this: Keep still and listen. Let him talk. Give him plenty of time to explain his idea. Listen with a fair and open mind. Listen, if possible, from his point of view rather than that which is habitually your own. And, if it doesn't hurt too much, listen sympathetically, and perhaps with a smile of encouragement now and then.

Then, ask questions. Not questions that will freeze up his spirit of helpfulness, but questions that will reveal your warm interest in his idea, and which will help to discover the value or lack of value in the idea itself.

Decide, if you can, on the spot. If the idea is worth something, let the lad know it. Let him know that he has made a worthwhile contribution to the present and future success of the business. Give him a taste of the joy of creative thinking, but don't let him drink too deeply, if it seems to go to his head. And if the idea is of little or no value, take the time to tell him why. Stick to the conversation until you have convinced him that you have given him a square deal. Let him feel, whether you like his big idea or do not, that he has won your own approval because he has given thought to your business and its problems.

If you cannot decide on the spot, then make note of the idea and promise definitely that you will give him your decision later. Try to tell him just when you will let him know. Then keep your word with him.

Once upon a time the incandescent lamp was a "half-baked" idea; the battery was a "brainstorm"; the dynamo was whirling "madness" in some man's head; the telephone was "foolishness"; the electric refrigerator was "impossible"; and radio was a kid's amusing "toy." Once Faraday and Wheatstone and Pacinotti and Gramme and Bell and Brush and Thomson and Sprague and Westinghouse and Edison and Steinmetz and Coffin and a host of others like them were only youngsters. But these youths and their ideas have transformed the world and human life.

Do you know the day or the hour when an unknown lad in your own plant may walk into your office with an idea that may be equally revolutionary or evolutionary? In such an hour fortune in disguise stands waiting before you. Listen, for your day passes and in the end—youth will have its way. Do the young men in your business know that their dreams and visions focused into ideas will receive a welcome and a square deal from you?

How Can We Effect

Destructive business practices are forcing executives to the conclusion that group influence must be permitted, under the law, to establish policies which will effect economic stabilization

IN any discussion of the economics of our competitive system and the anti-trust laws, a few premises may be stated as follows:

It is impossible to divide individuals, corporations or business units definitely into one of two classifications, consumer or producer. All are in both and the interests of both groups are intricately interwoven in our competitive system and in what we legally term the public interest. Any conditions, therefore, which seem to create an economic advantage for the one class as distinguished from the other are superficial, as those conditions must ultimately affect the economic welfare of all.

In relation to any product and under any given conditions of supply and demand, there is that price level which, taking all factors into consideration, is in proper economic balance with what is for the permanent economic good of the public. This might be termed the normal current price level. Artificial stimulation upwards or the lowering of this price level through destructive competition is also against the ultimate economic welfare.

Our anti-trust laws as originally formulated were directed against, and intended to correct, merely one phase of this situation. They give absolutely no direct relief under the other, which may be equally uneconomic and equally against the real public interest.

Even under existing anti-trust laws, the whole tendency of recent years has been toward mergers and combinations, both horizontal and vertical, and the economic history in any industry, where such large aggregations of capital exist, leaves grave doubt as to whether under severe competitive conditions, the relatively small competing unit can survive, entirely independent of whether the competition is of the destructive kind or not. The final result is monopoly, brought about through economic forces, but with the possibility of being equally against the public interest as those monopolies against which our anti-trust laws were originally directed.

These premises indicate some of the problems which today are troubling the competing units in any industry. Public opinion is certainly sympathetic toward some form of relief which will prevent our competitive system from breaking down.

As a further premise, it may safely be stated that ninety per cent of the members who join any trade association do so in the hope that, through the activities of that association, competition will become more sane and more economic, and that some degree of price stabilization will be effected. Much as they recognize the value of other activities, it is improvement in the competitive commercial situation that really counts. No one of sound judgment wishes to do this illegally, but unless a trade association realizes its full responsibilities in the commercial situation, to the extent that it may properly do so, it cannot satisfy the majority of its members.

Relief in the competitive commercial situation has two possibilities:

First. A change in the law permitting such agreements between competitors as are clearly in the public interest and possibly involving some form of government supervision, such as now exercised over the railroads and public utilities. Exceptions have already been made in respect to the cooperative marketing of farm products and foreign trade.

Second. The executives in each industry must have sufficient courage to develop policies which will cope with uneconomic competition and sufficient confidence in each other and in the right of their position to make these policies effective.

The question of a change in the law requires very careful thought and, if constructive legislation is to be developed, full cooperation with the executives in other industries. This line of approach offers no immediate relief. The electrical manufacturing industry should not, however, sidestep this issue and should undertake the formulation of a definite policy in respect to such legislation. Recent articles by James H. Williams in the *Atlantic Monthly* for March and by Julius Kahn in *Nation's Business* for February, show the serious thought which is being given this subject by executives in other industries. It is even intimated that those units in industry which represent in respect to their competitors relatively large aggregations of capital, would not be interested in effecting any change, as the present situation if continued will make the strong stronger and finally eliminate the weak.

We are not concerned in this discussion with a fundamental change in the law but with the degree of cooperation which can be undertaken under existing legislation to effect some degree of economic stabilization.

From the strictly legal standpoint we are advised that there are three danger signs against which we must weigh the degree of cooperation that competitors may properly employ in respect to economic stabilization:

First. Proposals which are clearly in restraint of trade and contrary to the existing laws such as price fixing by agreement, allocation of territories or customers, limitation

WHEN laws that have been passed for the protection of business begin to operate in such a way as to defeat the purposes for which they were established, it is time to consider what can be done to remedy the situation. Executives in many industries are giving serious thought to the economics of our present competitive system and to our anti-trust laws. Recent articles by James H. Williams in the *Atlantic Monthly* for March and Julius Kahn in the *Nation's Business* for February reflect the questions which business is asking itself today on this important subject. In this article Clarence L. Collens, president, Reliance Electric & Engineering Company, Cleveland, outlines the degree of cooperation which he believes electrical manufacturers may undertake under existing legislation to effect economic stabilization.

THE EDITOR

t Price Stabilization?

By C. L. Collens

President, Reliance Electric & Engineering Company, Cleveland, Ohio

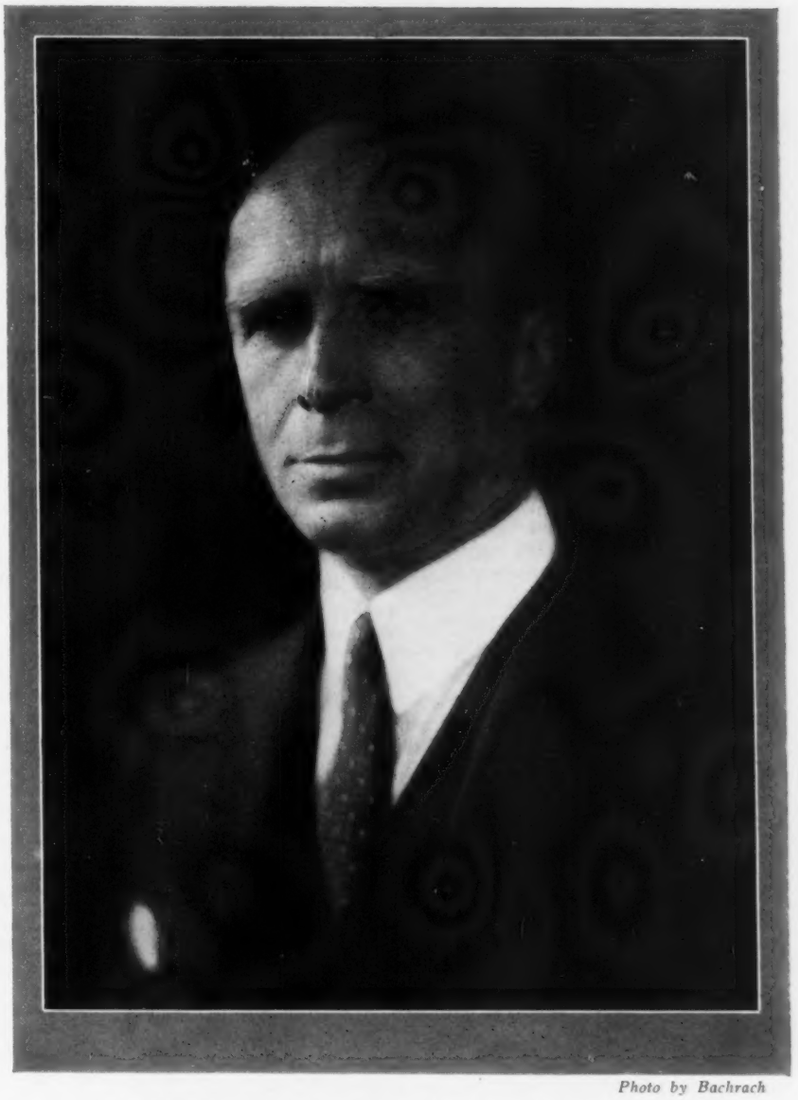


Photo by Bachrach

EXECUTIVES must have sufficient courage to develop policies which will cope with uneconomic competition and sufficient confidence in the right of their position to make those policies effective.

CLARENCE L. COLLENS

of production, and similar proposals.

Second. Proposals which are legal on the surface but which must be viewed from the standpoint of the intent and purpose which prompts the proposal. Legal procedure cannot be used to indirectly accomplish an illegal purpose.

Third. Even where the intent and purpose is perfectly proper, any proposal must again be weighed from the standpoint of the final result which may ultimately be the effect of that purpose.

Hence from the standpoint of the law and looking into the future, we are informed that either the intent and purpose are questionable or the final result and effect might be viewed as improper. This is perfectly sound legal advice, but is it in all cases sound business advice and does it properly represent the courage which business executives must exercise to cope with destructive competition? Due weight should also always be given the question as to whether the *means* employed must *necessarily* have the effect of *unreasonable* restraint in trade.

None of us wishes to be a party to any proposal or activity whose necessary result or effect is clearly illegal, but some of us feel we have the right to accomplish such degree of economic stabilization as can be brought about by proper education in respect to the economics involved and a full discussion and determination of the policies involved, always recognizing that our activities in this direction must be limited to mere "influence on the individual intelligence" and cannot be backed by any compulsory or mandatory powers.

From the strictly legal viewpoint we are told that we may endorse a one-price policy because even if each manufacturer individually adopted a one-price policy, the one-price by each competitor on any negotiation may vary all the way from far below cost to an unreasonable profit and the purchasing public would still be protected in its legal right to buy below cost. But we are also told that from a strictly legal viewpoint we cannot couple with the endorsement of a one-price policy a statement as follows:

It is to the economic interest of the purchasing public that each bidder, under any inquiry from a buyer asking for prices, submit a price which, with a full knowledge of his costs, will give such profit as is necessary to maintain his business on a permanently sound, economic basis.

The reason given is that the coupling of such a statement with the endorsement of a one-price policy, if generally put into effect by the individual competitors, would result in restraint of trade. We are told that the buyer has the right to have unrestrained competition among all those who produce whatever he wishes to purchase and the suppliers' actions are not to be tested by economic principles which would be of benefit to the entire purchasing public, but they must be completely at liberty to quote to the buyer whatever price they wish, even if below cost and even if the quoting of such prices would put them into bankruptcy; that the law favors destructive competition in

that it will not allow agreement, understanding or concerted action to prevent it; and that what the law does not allow if done directly, it does not allow if done indirectly.

But the Supreme Court says:

"In the absence of a purpose to monopolize or the compulsion that results from contract or agreement, the individual certainly may exercise great freedom; but concerted action through combination presents a wholly different problem and is forbidden when the necessary tendency is to destroy the kind of competition to which the public has long looked for protection.

"The natural effect of the acquisition of wider and more scientific knowledge of business conditions, on the minds of the individuals engaged in commerce and its consequent effect in stabilizing production and price, can hardly be deemed a restraint of commerce, or if so, it cannot be said to be an unreasonable restraint, or in any respect unlawful.

"Competition does not become less free merely because the conduct of commercial operations becomes more intelligent through the free distribution of knowledge of all the essential factors entering into the commercial transaction.

"It is not the purpose or the intent of the Sherman Anti-trust Law to inhibit the intelligent conduct of business operations, nor do we conceive that its purpose was to suppress such influences as might affect the operations of interstate commerce through the application to them of the individual intelligence of those engaged in commerce, enlightened by accurate information as to the essential elements of the economics of a trade or business, however gathered or disseminated.

"The Sherman Law neither repeals economic laws nor prohibits the gathering or dissemination of information."

Even recognizing fully that these quotations merely represent a trend of thought in reaching a decision under a given set of facts and cannot be too generally applied divorced from those facts, they nevertheless give us some justification for the application of the rule of reason to any proposals which may be made. A trade association certainly has some right to introduce *influences* which are admittedly intended to affect the *individual intelligence* of those in control of the competing units. In respect to certain statistics the Supreme Court recognized stabilization of prices as a necessary result but not necessarily unlawful or in unreasonable restraint of trade.

From the decisions already rendered and from a strictly legal viewpoint, any group influence which may have some effect on prices must be limited to statistics of a specified scope—that is, the making public of facts only—and cannot be extended to the formulation of policies, even though those policies have no relation to facts, do not and cannot *fix* price levels and even though there is no agreement or understanding enforcing those policies on the members of the trade association. Even in the making public of facts, a trade association cannot attempt to interpret those facts, give advice, or express opinions tending to influence the decisions of its members.

As stated above, this is a perfectly sound legal viewpoint to take, but I raise the question as to whether it is the position that business executives should assume and whether the time has now come when group influence on the individual intelligence must be extended beyond the realm of statistics into the realm of policies admittedly intended—not to *fix* price levels—but to effect some degree of economic stabilization under whatever price level results from the free play of enlightened competition and the law of supply and demand. All individuals are consumers and the days of barter and trade are past in practically all consumption products. Public opinion is being educated to, and does indorse, price stabilization in industry also.

The determination of the normal current price level must always be left to some market leader. There must be no effort to protect the marginal producer or hold an umbrella over inefficiency, but in any industry the other competing units have the right to expect that, in setting the current price level, the market leader will weigh properly all those factors which will promote the permanent economic welfare. The public interest includes his competitors as well as all consumers.

In the Trenton Potteries case the Supreme Court has clearly indicated that the *reasonableness* of the prices fixed, or the good intentions of the combining units, do not make legal any form of *price fixing agreement* between competitors, but there is nothing in the law which prevents a market leader from setting price levels which are reasonable and which promote the permanent economic welfare.

Endorsing the principle that there should be a reasonable profit even coupled with the endorsement of a one-price policy does not fix the price level and is in my opinion a proper influence which a group of competitors may exercise on the individual intelligence.

So much for the determination of the price level itself. Assuming a proper determination of the price level, even a group of electrical manufacturers has some right further to extend its influence on the individual intelligence to promote proper economic stabilization under that price level. I feel it has the right:

First. To discourage price cutting by including a statement to that effect in a code of merchandising ethics.

Second. To formulate some policy in reference to the economic and demoralizing effects of recognition of annual purchasing power in the price made, or of annual quantity discounts.

Third. To investigate and formulate some policy as to whether the public interest is best served by freight equalization and free delivery points.

Fourth. In cooperation with other branches of the industry, to study the costs and channels of distribution and formulate some policies which will assist the economic classification of the trade and the economic distribution of products.

Fifth. To formulate policies which will assist in elimination of price discrimination and which will tend to make the classification of customers, the terms and conditions of sale simple and easily understood by the purchasing public and by competitors.

These are merely illustrative. In many industries, we see definite price levels established with no charge of collusion and economic stabilization under those price levels with no criticism on the part of the government or the purchasing public. Has the electrical manufacturing industry some inherent characteristic which requires that each transaction must be one of barter and trade and prevents the formulation of policies which will assist in eliminating demoralization and commercial confusion?

I RAISE the question whether the time has now come when group influence on the individual intelligence must be extended beyond the realm of trade statistics and into the realm of policies as admittedly intended, not to fix price levels, but to effect some degree of economic stabilization under whatever price levels may result from the free play of enlightened competition and the law of supply and demand. There must be no effort to protect the marginal producer or to hold an umbrella over inefficiency, but in any industry the other competing units have the right to expect that, in setting the current price level, the market leader will weigh properly all of those factors which will promote the permanent economic welfare. The public interest includes his competitors as well as all consumers.

CLARENCE L. COLLENS

MARKET SURVEYS

What—Why—How—When

Photo by Fairchild Aerial Surveys, Inc.

BY R. O. EASTMAN

President, R. O. Eastman, Inc.
New York and Cleveland

THE foundation of every industry is its market, by which we mean the people who buy and sell and use our products. Markets are people—not sales territories or money—but people. Every business depends wholly upon the people constituting its market.

Everything that happens from the fabrication of the raw materials to delivery to the customer should be (but all too frequently is not) guided by the knowledge of what the people in the market are thinking and doing. The only excuse for manufacturing a product is to sell it. It is our job to produce commodities that *can* be sold at a profit. To do that, we need to know something about the fellow who is expected to buy it. As Mr. A. W. Shaw has aptly written, "Production begins with the consumer." The only excuse for a sales organization, sales policies, sales methods, is to sell at a profit. Again we need to know something about the fellow we hope to sell.

Only recently have we acquired this point of view. Before the War, during it, and in fact until 1920, the market was the least of our worries, speaking generally. Keeping pace in the factory with the demand in the market taxed all our energies. But those happy days seem gone. We learned in 1921 that our production facilities, speaking generally again, exceeded even our most remote dreams of consumption. High pressure salesmanship, extravagant advertising, new styles, new channels of distribution, price competition, new sales managers, new advertising agents, every conceivable device was, has been, and is being, tried out in an effort to increase sales. Distribution costs went skyward, and with *that* development came some evidences of sobriety.

Perhaps the most important thing we learned in this chaotic selling scramble was this: the market is the foundation of our business, the final judge of everything we do, and:

First. Our manufacturing and selling policies and methods must be planned and executed in the light of the conditions in the market, and the reasons for those conditions.

Second. If our program is based upon complete and correct facts about the market, we should prosper; if it is based upon guesses or hunches or incomplete or inaccurate facts, we fail to prosper as we should.

It is difficult to get the facts. The rapid development of national and international markets, the numerous factors working between the manufacturer and the consumers of his product, to say nothing of the vicissitudes of consumers' whims and fancies—all have made the process of getting the facts intricate and exacting. Thus the science of marketing research came into being, as the response to a very real need and demand for a scientific method of gathering and interpreting facts from increasingly complex markets and with regard to increasingly complex marketing. It has become evident that there are two separate and distinctly specialized functions in marketing: (1) gathering and interpreting the facts, and (2) administration in the light of those facts. Both functions require specialists of radically different types. One is scientific; the other, executive.

Manufacturers Confused on Surveys

THE place that market research now holds in business is very well portrayed by a study made last year by ELECTRICAL RECORD. Sixteen questions were asked of manufacturing concerns in the electrical industry with regard to their use of "statistics and market surveys." Without going into detail it is apparent from the answers (1) that among the electrical manufacturers there is a keen interest in market research, but (2) that there is little comprehension and a great deal of confusion as to the kind of statistics or surveys needed, how to go about procuring or conducting them, and the purposes they should serve. There seems to be a general recognition that business needs facts as applied to its distribution activity, but very little understanding of what kind of facts should be sought, where and when and how they should be gathered, or how they should be put to use.

Here is my definition of market research: It is the process of (1) determining the real marketing problems of the business; (2) getting the facts in a scientific manner from sellers, purchasers and users to apply to those problems; (3) interpreting the significance of the facts to the business; (4) developing a sound course of action, in the light of those facts, to increase profits.

My purpose here is to show briefly the proper relation of market research to production and distribution and selling, how market research is conducted, and results achieved.

Production. Be it a commodity or service, the thing

which a company sells is probably its best salesman. The product itself undoubtedly makes or loses more sales than any other single factor in the business. It is of utmost importance, therefore, to keep constantly informed about the changing of the demands of consumers with regard to the product.

Is the type, style, size, weight, color, and price right? Could a change of any of these increase sales to greater profit? Who knows? The manufacturer? Decidedly not. The dealers? Possibly, but not probably. The consumers themselves are the final judges. Be their verdict right or wrong, their verdict is final. Every day our product is judged in the Court of Consumer Experience, and we are not present to hear the evidence or the verdict. Today our product may be under consideration by five thousand people and rejected by four thousand five hundred. Why? Only the consumers know, and only by asking the consumers will we ever know. And why did the other five hundred decide in our favor? Again we do not know, but we can find out by the same process. We have discovered in altogether too many surveys vast differences between the *real* reasons why consumers buy specific products and the reasons the manufacturer had why they *ought* to buy. The only way a manufacturer can be *sure* that his product is *right* (right in the market, not in his own estimation) and that it is performing the big selling job for which every product has the potentiality, is to go to the market and find out—and find out *why*.

Distribution. Few manufacturers have a clear picture of their distribution. Few of them know what proportion of the possible dealers and jobbers carry their products, in the country as a whole, in each sales territory, in cities of various sizes, or according to various kinds of dealers. And yet what could be more important? To know the *number* of outlets is far from sufficient. They should know the *proportion*—the extent to which they have *all* of the possible outlets, or of the desirable outlets. And few of them even know the *number* of outlets accurately.

It is vital to know not only whether you have *enough* jobbers and dealers, but also whether you have the *right kind* of distributors. And that can be answered only by determining through research in the market itself the extent to which consumers go to the various *kinds* of retail outlets to buy your merchandise. More than one company has circumscribed its market and its sales by selling its goods through the wrong kind of retail outlets.

The relationship existing between the manufacturer and his jobbers and dealers as compared with the relationship between his competitors and his competitors' distributors, in terms of goodwill, discounts or mark ups, window and counter displays, newspaper advertising, is a subject on which there usually is only the most fragmentary information. Yet market survey after survey has shown such relationships to be responsible for great marketing achievements and equally great marketing failures.

Selling. Here we refer to all the methods used to broadcast *ideas* which, necessarily, must precede the broadcasting of merchandise or service.

R. O. Eastman

R. O. Eastman has always been a marketing man. While in charge of sales and advertising for the Kellogg Company, Battle Creek, Mich., he inaugurated the first study of magazine circulation duplication undertaken in this country. Later he organized the first research department of an advertising agency. Two years later he started his own independent research organization, which has always been exclusively devoted to market research work. This organization has served several hundred companies, including manufacturers, trade associations, department stores, publishers, and advertising agencies in more than fifty industries —The Editor.

What is the intelligence and opinion of the market with respect to our product? What proportion of the market is utterly unfamiliar with it, only vaguely familiar with it, or completely familiar with it and its advantages and its uses, and what proportion uses it?

These are steps in the selling job. What is the situation with regard to our product for the country as a whole, in each sales territory, in cities of various sizes, according to people of various incomes, ages, vocations?

Such information has been indispensable to a number of successful manufacturers in their advertising. It showed them where they needed to direct their advertising—north, east, south or west—according to cities of various sizes, metropolitan centers, large and medium and small cities, farming localities, and according to various kinds of consumers. And (of equal importance) it showed them the precise character of the educational job that the advertising should accomplish.

Basically, market research does two things: reveals (1) the true conditions in the market, and (2) the real reasons for those conditions. Here is an illustration—a brief description of a survey of the industrial lighting market given by an executive of a lamp manufacturer for whom the job was done:

A survey covering practically every type of industry was conducted in fifteen States in the industrial section of the United States. Four hundred and forty-six interviews were obtained with industrial executives, purchasing agents and plant electricians. Coincidentally a survey on the subject of industrial lighting was made among the company's jobbers and dealers.

The important facts developed by the survey were as follows:

1. Twenty-five per cent of total production of all plants was made either artificial light. About 17 per cent of the plants did 5 per cent of their work under artificial light. Varying other percentages up to 90 represented the amount of work done under artificial light in different plants.

2. Thirty-four per cent of owners or executives were quite satisfied with their present lighting; 51 per cent were fairly well satisfied; 1½ per cent were simply uninterested and the balance dissatisfied. Eight per cent were very eager to improve conditions and knew there was something wrong with the installation. These facts indicated that 8 per cent of the plants under survey were immediately a market for better lighting.

3. Only about 27 per cent of the plants called on had even fairly good lighting.

4. Eighty per cent of the manufacturers interviewed gave increase in production as one of the benefits to be derived from better lighting; 70 per cent gave decrease in spoilage; 60 per cent gave prevention of accidents; 50 per cent gave improvement in discipline; and 40 per cent gave improvement in hygienic conditions. From the standpoint of the salesman this analysis meant that increase in production was the thing for him to emphasize.

5. The survey showed that the president of the organiza-

(*Continued on page* 84)

Waste in DISTRIBUTION— Our *Gravest* Business Problem

What are electrical manufacturers doing about the problem of marketing costs?

BY DR. JULIUS KLEIN*

Director of the Bureau of Foreign and Domestic Commerce, Department of Commerce

THE wastefulness of our distribution system is beyond question the gravest issue now before the industrial and commercial community of this country. The efforts of our business machinery to make headway with the present combination of scientific mass production and haphazard antiquated distribution is like a modern giant-capacity truck trying to deliver its load of up-to-date, efficiently produced commodities by creeping along the highway of commerce under the power of a "one-lung," prewar vintage motor. All of the economics and laboriously achieved savings represented in the load are completely eaten up by the flagrant wasteful futility of the motive power. If distribution is simply motion applied to materials, as defined by one distinguished authority, then certainly much will have to be done before we can rightfully claim to be getting anywhere in terms of profitable operation.

Our production methods are without equal the world over, with maximum output records per worker as well as per industry in most of the major staples, whereby the industrial preeminence of nations is appraised. But this is only one-half of the ledger. If the record is to balance, and if we are to achieve substantial solvency during the stress of increasing international as well as domestic competition, if we are to survive any temporary uncertainties which are bound to occur in various localities or trades, we must not accept our present method of operating with complacent satisfaction. To let well enough alone at this crucial stage of the world's business history would indeed be to invite a disastrous breakdown with the first stretch of rough going.

The modernization of our sales strategy is absolutely essential if we are to retain our present commercial supremacy. Using the calculations of the engineers appointed by Secretary Hoover to study waste elimination, the nation's losses from inefficient distribution may be estimated as approximately $8,000,000,000 annually.

The details of this truly appalling charge on our national resources and earning power could be elaborated almost indefinitely. To take a single item at random, careless administration of retail credits through overextensions, slipshod installment selling and the like, piles up an annual loss which has been reliably estimated at not less than a billion dollars a year. There is no way of checking accurately, in dollars and cents, the losses involved through inadequate sales operations—overselling poor markets and ignoring good ones; nor is it possible to appraise or even to guess with reasonable accuracy the losses involved in scores of other phases of our distributive processes.

It is alleged that it costs too much to distribute commodities; that the margin between producers and consumer is too great; but when we come to examine the actual profits of wholesalers and retailers, there is no sign of any widespread opulence. In fact, they are pretty well at the bottom of the scale, in terms of business income, with an average profit of 2.2 per cent in 1925 as compared with 5.9 for manufacturers and 12.5 for bankers.

Dr. Julius Klein

Time after time various earnest trade organizations have made determined assaults upon some phase of the problem in their special field, only to be overwhelmed by an entirely new development in distributive machinery. Chain stores have expanded unbelievably, and, what is more important, they have gone beyond their original cash-and-carry principles, bringing them into closer competition with the so-called independents. Mail-order houses no longer rely exclusively upon ponderous catalogues, but are constructing retail outlets of their own in scores of cities. Other new distribution factors have developed in abundance; house-to-house canvassing, cooperative wholesale buying, installment selling, hand-to-mouth buying and numerous other innovations.

With our entire distributive system in such a state of flux, it is doubly important that every possible effort be made to gage these transformations and estimate their effects upon the whole business system. In these days it is vital that every effort be made to eliminate each item of unnecessary sales expenditure. The fundamental philosophy of lowering prices so as to increase consumption, of minimum margins of profits and mass turnover, which have been so conspicuous an item in the success of many of our industrial undertakings, can be applied with equal effect to distribution.

Today every prosperous manufacturer knows accurately each item of his costs. But can we safely make the same statement of our distributors? It is certainly the exception rather than the rule for any establishment to have its sales costs accurately distributed by percentages as among its various commodities or items.

Answering the query, "What are you doing about it?" which was recently submitted to a large number of distressed firms, 73 per cent of them reported that they were endeavoring to reduce production costs, but only 29 per cent indicated any efforts to cut sales expenses.

Among the 10,300 queries reaching the Department of Commerce each day for business data, the trend of those dealing with domestic trade problems reveals the major shortcoming of the inquiring firms as "blind" marketing—attempting to sell in territories whole sales possibilities have not been carefully investigated. For example, a paint concern launches a widespread sales campaign in a certain state simply because it was listed as "prosperous territory," ignoring the fact that 85 per cent of its dwellings are made of brick and offer at best only a moderate potential demand.

Coupled with this is another inexcusably wasteful sales method, the danger of "going national"—of endeavoring to gratify the vanity of the firms' executives (or perhaps of succumbing to the allurements of some high pressure advertising salesman), by "spreading the line all over the country." This is, of course, an excellent policy for a commodity with deservedly nation-wide appeal, but not so profitable in the long run for thousands which are less favored.

It is only through widespread publicity, through the aroused conscience of trade associations, the fine service spirit of national publications, and particularly the determined pressure of militant consumers throughout the land that this grave problem can be ultimately solved.

**From an address delivered before the Chamber of Commerce, Buffalo, N. Y., April 18, 1928*

WHY the *Minimum*

Above are shown disconnecting switches stacked up at the end of the assembly line. To the right are transformers being crated. Under the quantity production system, both lots will go into storage until there is a sales demand for them. If standards of performance were required of them, they would be assured of eventual sale as long as the standards they adhered to remained the same. No new manufacturing fad would render them unsalable

IN discussing the subject of minimum standards of performance for electrical products, it would seem best to confine the discussion as much as possible to consideration of the broader aspects of the problem and not to confuse the issue by too much reference to specific lines of apparatus. If standards of performance are of value to the industry, they should be adopted as rapidly as is reasonable for all classes of apparatus. If we take up specific apparatus, endless discussion might arise which might be immaterial to the broader question, although quite important, and governing, for the specific apparatus or the particular time at which the discussion took place.

In considering a question so vital to the industry as this, we should bear in mind all the time that the adoption of a program of standardization must necessarily take into account the element of time. It would be impossible and impracticable for us to determine upon standards for all performance and for all apparatus, and adopt them within a short time. Orderly analysis, consideration and procedure must take place. Therefore, I thought it best at the present time only to consider the question from a very general standpoint.

Chaotic Conditions Existed

WE all, long ago, began to recognize that standards of speed, capacity, voltage and insulation values were necessary, important and desirable. Before the adoption by the industry of such standards, the design of electrical apparatus in general was chaotic. We all remember the difficulties which arose from the adoption of the relatively small number of frequencies in this country, and what trouble and expense it was to arrive at our present 60 and 25 standard. This was not only troublesome to everyone connected with the industry but also, as is always the case, the ultimate cost was paid by the user.

These standards removed, from the competitive operation of selling, the habit of using special speeds and capacities in selling, which habit resulted in innumerable values of these elements in design and, therefore, complication in our design and manufacturing problems. No one will dispute the enormous value to the industry—considering the industry not only as including the manufacturer, but the user and the manufacturer of power—of the adoption of the standards of speed, capacity and voltage.

Generally speaking, these standards have been lived up to by the various manufacturers, but there is still a tendency on the part of some to obtain a favored position in connection with any one particular line of effort or negotiation by sacrificing these standards. It is needless to say that the use of such modifications of standards, where unnecessary and undesirable, is a confession of weakness. It usually results from a demand by the sales department upon the engineering and manufacturing departments, generally for the purpose of making the selling operation easier. This practice or tendency, wherever found, I think we will all agree should be resisted.

Another standardization which is now taking place is that of dimensions. Standards of dimensions, common to all manufacturers, present no particular fundamental advantage to any one manufacturer. Dimensions, of course, must be such that there is space for the proper design of the piece of apparatus. After this is taken care of, there is no good reason why a standard dimension among manufacturers would not be beneficial to the industry. It would simplify the problems of application of the device to the various uses to which the device is put and this in turn would tend to lessen special work on the part of the manufacturer.

Production and Distribution Costs

IF electrical manufacturers in the United States are to maintain their place in the world market and at the same time maintain a scale of wages which will permit our present or an advanced standard of living, this must be done through an increased attention to the costs of production and distribution. To achieve this, there must be a degree of standardization sufficient to maintain a given model until the expensive machinery necessary for its production in quantity may be justified. While dimensional standards are essential to permit low cost production and distribution, performance standards are sufficiently involved to make this an essential part of any major program along this line. In electrical apparatus a change in performance standards may necessitate a change in dimensional standards. No standard, either dimensional or performance, should be so fixed as to make changes impossible, when a real necessity for change arises.

In considering the subject, we should bear in mind the advantages to all—and by *all* I mean the manufacturer, the application engineer, the manufacturer of power

**From a paper presented before the Policies Division Meeting of Nema at Chicago, March 15, 1928*

Electrical Product NEEDS

Standard of Performance

The adoption of standards is one of the ways the industry can best serve its customers, as well as reduce its own production and distribution costs and increase efficiency

By Walter S. Rugg*

Vice-president in Charge of Engineering, Westinghouse Electric & Manufacturing Company

Walter S. Rugg has been vice-president in charge of engineering of the Westinghouse company since 1925. Prior to that he was general sales manager. He has been with the company since 1892 and is a graduate of Cornell University

and the user. It is clear that a maximum standard of performance would not be necessarily beneficial. I take it that a motor, for instance, designed for a maximum standard of performance would not take into consideration the cost. It might have the highest efficiency and lowest power factor, but be very high in cost and, therefore, would not be the best balanced performance for the ultimate user.

Balanced Standard Economic

ALL elements must be taken into consideration if we are to obtain a standard which will be the most useful to all interested parties. The unbalanced design results always from special emphasis upon some particular part of the design, and it stands to reason, from an economical standpoint, that it can never be the best standard. The balanced standard would necessarily be the most economic standard from all standpoints. Broadly speaking, the question is an economic one.

The minimum standard would, of course, be the highest standard reduced to what is practical and economic for all. The machine is for some useful purpose. Its design should be such that it gives the user the best all-around service, taking into account first cost. A machine is an economic device used by someone for an economic purpose; therefore, a standard should be such that the economic purpose is best accomplished.

Practically every design of electrical equipment and apparatus is the result of a certain amount of compromise of characteristics which may be conflicting if they are carried to an extreme. A minimum standard for the performance of any piece of electrical apparatus should require that all essential characteristics are such as to provide for a generally satisfactory performance. When such a standard is made by the manufacturers and is accepted by the users, low cost production and distribution can be achieved. In periods of depression, manufacturers can build up stock with the positive assurance that the stock will be salable when business picks up. The user is assured of an article at all times of standard quality. Experience shows that defectives are much more frequent in articles of special characteristics and made in relatively small quantities, than in standards made in large quantities. Standard quality and large quantity production is not undertaken unless the manufacturer is quite sure that any defects in design, material or process, thoroughly eliminated before the manufacture, is undertaken.

Minimum standards would provide a bench mark, and, at any given time, this bench mark would be the best judgment of all concerned. This standard should represent a satisfactory commercial decision and be the best that can be made at the time. It also provides a point of departure for improvement when and if new materials, new developments in design or new requirements may make it desirable to change the standard. It prevents the over-emphasizing and over-advertising of some particular characteristic to the detriment of other characteristics which may be essential.

Advantageous to Stable Lines

MINIMUM standards of performance should be especially advantageous in all lines of electrical apparatus which have been long enough established to have arrived at a more or less stable condition. This is certainly true of such things as transformers, motors, meters and small devices. There could be no objection to devices having certain characteristics better than the minimum required standards. There should, however, be a penalty attached to devices in which any characteristic is below the minimum agreed standard. Adoption of minimum standards does not prohibit manufacturers from stressing superior characteristics, but it does prevent the user from being loaded up with unbalanced design and performance.

All this assumes that each minimum standard adopted be most carefully considered and approved by the major parties at interest. In many cases, it probably means the abandonment of certain of our present designs, and where such a standard involves changes in design which affect any manufacturers, such standards should not be made mandatory until a sufficient period has elapsed to provide for the necessary changes and the disposition of stock which may be entirely usable but not quite up to the desired standard. A minimum standard, when agreed upon, should be so adjusted as to require no immediate undue cost of redesign and retooling. The burden to all should be made as low as is practicable. A gradual raising of the standard would naturally follow as our skill increased, but the cost of arriving there would be distributed over some time.

Fundamentally, the minimum balanced standard design would accomplish a balance between the following:

1. Lowest cost of manufacturing and distribution
2. Greatest adaptability to the purpose for which the apparatus is to be used
3. Greatest durability—or its length of life
4. Lowest cost of maintenance
5. Lowest cost of power for operating it

Summing it all up, therefore, a minimum standard of performance is simply one of the ways that an industry can best serve its customers. We all recognize that industry thrives to the extent that it serves

its customers satisfactorily. A user cannot be best served by an industry which allows all of its members to decide these things as they happen. We should all strive for a balanced perfection. That balanced perfection should be before all of us as a bench mark to shoot at. Not fixed—not the same today and tomorrow and forever—but dynamic, to be changed as the average ability of the industry makes it possible.

We have now seen that the suggestion of the adoption of minimum standards by Nema is simply another step in a change which has been taking place in industry for a good many years, tending toward greater efficiency in production and more satisfactory apparatus for the user's purpose.

If we assume, therefore, that we are all in favor of standardization and that we believe that sooner or later minimum standards of performance must be added to what has been done in similar characteristics of the apparatus—capacity, speeds and dimensions—the question before us is, "What shall we do about it?" If it is a good thing we ought to make a beginning. If we make a beginning, we will proceed and as time goes on we will find that the process naturally accelerates by practice and acquaintance, and it would be but a short time before it would become more or less common practice. Each of our committees, having to do with our various lines of devices, should choose one of the simpler elements of its line of apparatus and determine and agree upon a minimum standard for that line. Experience and practice obtained in doing this would lead to the extension of the practice.

If Nema decides to begin the process of approving and adopting minimum standards for the best good of all, it should proceed to adopt these standards only after consultation and cooperation with the other elements which are specially interested; namely, the user, the manufacturer of power, and the manufacturers of other apparatus, who use our products. This perhaps could be best done by cooperation between our society—through cooperative committees — and the various associations representing the elements above mentioned; namely, N.E.L.A., the various trade associations, other manufacturing associations, and the engineering fraternity represented by the A. I. E. E.

I regard this cooperative adoption as an important element in our procedure. This results from the fact that standardization must be a compromise and must result in a balanced design best serving the purposes of all concerned. Any movement of this kind necessarily requires some power to put it into effect. How to do this is a very grave question. It is easy to pass a law but difficult to enforce it. It is easy to adopt a resolution and difficult to have the resolution effective.

It would seem to me that Nema should pass a resolution expressing its approval of the idea of a minimum standard and its intent to proceed to bring about the adoption of minimum standards throughout the industry as rapidly as is consistent with good practice. This resolution and intent should be published throughout the industry—not only the manufacturing end of the industry but also all of the related interests should be notified that this is the intent of Nema.

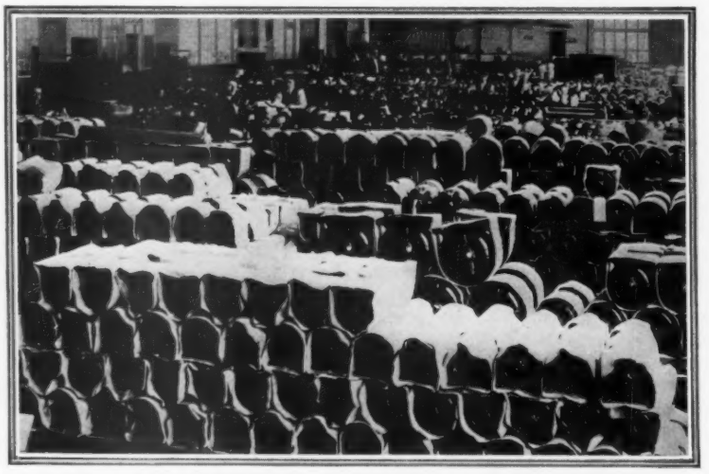
No Non-Adherence Penalty

THIS, in itself, would tend to bring about the desired results and the early accomplishment of our purpose. After a minimum standard has been adopted and everyone advised of such adoption, it would be unreasonable to expect all manufacturing establishments to adopt it suddenly. A certain amount of time should be allowed for adjustment; so the adoption of a standard should not be put into effect until after the expiration of a reasonable amount of time—say, one year. After this has been done, there will always be a certain number who will lag behind either because they do not believe the standard is a just one or because of the difficulties of adapting their particular design to the new standard. This brings up the question of penalty for non-adherence to standard.

After thinking this matter over considerably, I can see no way of effectively penalizing any one directly for non-conformity to standard. However, I believe a practice could be adopted by Nema which would continually tend toward an improvement along this line. If the various members of Nema could come to a mutual agreement that after a certain date all bids, upon the apparatus for which a minimum standard had been adopted, would contain a statement that the apparatus bid upon conformed to the Nema standard, I believe it would effectually bring all manufacturers into line. The salesman of a manufacturer who had adopted the standard would naturally call attention to this fact and would make it a selling argument for his apparatus. The salesman of a manufacturer who had not adopted it would, therefore, continually urge his manufacturing plant and engineers to get into line. In other words, a manufacturer who would not conform to this minimum standard would have to make excuses.

There would be a tendency perhaps, in order to increase sales, to make performance guarantees better than the standard. This, however, would be somewhat self-corrective because it would be rather difficult to improve one part of the design without sacrificing some of the other elements of design either in cost or in performance. However, any improvement which could be made would be along the right direction because, do the best we can, the minimum standard will probably be found from time to time to be too low. And, after all, a minimum standard should be considered not as a static thing but as a dynamic thing and subject to change from time to time.

Something should perhaps be said regarding the particular place for the use of the minimum standard. I take it that a minimum standard should, without any question, be used for standard apparatus which is manufactured in large quantities. In the production of certain special apparatus of which only one, or at least a few, will perhaps ever be made, a strict compliance with a minimum standard might become costly and impracticable without materially benefitting the user. It stands to reason, therefore, that we should not contemplate, necessarily, always conforming to minimum standard upon special apparatus. I think, however, the agreement to make the statement in the bid as to whether or not the apparatus was manufactured in accordance with Nema minimum standard, would cover this situation. It would be reasonable to expect all of us to build special apparatus in accordance with Nema minimum standard unless the cost was too great. If the cost was too great, the statement that it did not comply with the Nema minimum standard would naturally follow, with the reasons therefor. Again, this would tend to cause us all to conform to National Electrical Manufacturers Association standards if possible.



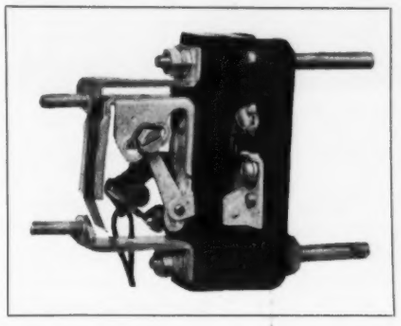
This shows fractional horsepower motors stacked up after being paper wrapped. These are manufactured in such great numbers that they should be assured the protection of minimum performance standards

The applying of engineering not only to design but also to application and to manufacturing methods is all a part of a struggle for greater efficiency in production—speaking of production as meaning the overall service to a user, from raw material to finished and delivered apparatus. We are rapidly and at an increasing rate doing away with the inefficiencies of human labor, and standardization is only one phase of that movement. Everyone in the industry, of course, now realizes the benefit of standards to the industry.

Make Your Motor Safe by Carefully Selecting

Overload Protection Devices

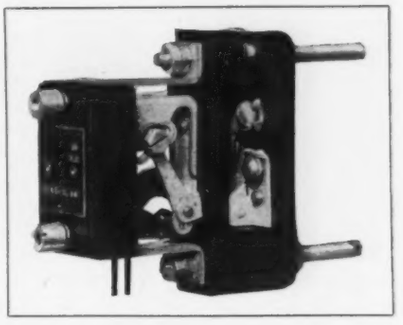
The type of motor you are using and its operating conditions will determine the kind of protection you require against unsafe overloads



By H. L. Smith

Industrial Engineering Department, General Electric Company

At the right is shown a view of a temperature overload relay with heater. At the left is the same relay with heater removed and the contacts in a tripped position. This device is designed for the protection of small motors having a maximum full load current of 80 amps. at 600 volts or less. When tripped, the contacts must be reset by hand. A pull-cord is provided for this purpose



EVERY motor should be properly protected against unsafe overloads. Thus, when selecting a motor for your motor driven machine you should give the most careful attention to the choice of overload safety devices. Not only the type of the motor, but also the kind of work you intend it to do, must be the deciding factors in choosing the type and rating of the overload device. It stands to reason that the motor of an electric planer cannot be protected adequately by the apparatus designed for a blower motor.

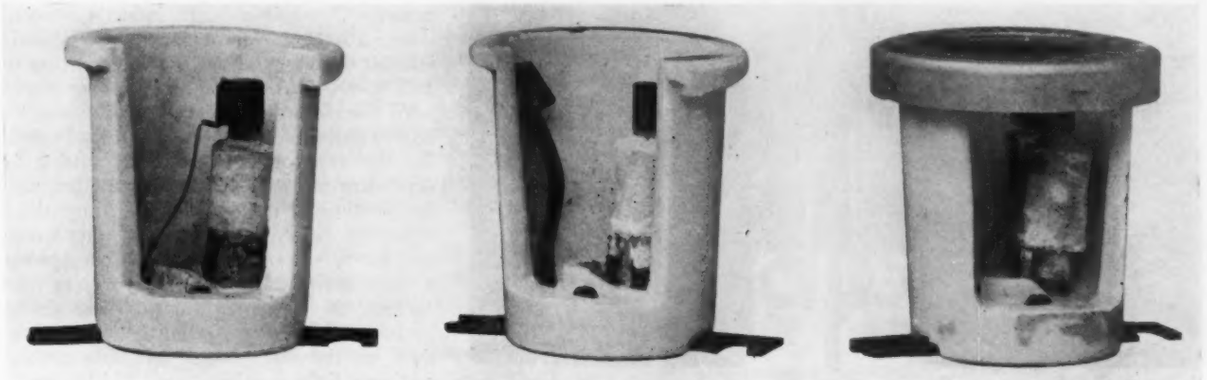
Some overload protection is absolutely necessary in every case. If your machine is to operate efficiently, it must not break down in such a way that it cannot be immediately and easily repaired and put back again into service. If an overload occurred to an unprotected motor, either your motor or machine would in time be damaged in such a way as to make major repairs necessary. It is but a minor matter to reset relays or replace fuses.

There are three different means of overload protection: (1) Fuses; (2) overload relays—instantaneous trip; and (3) overload relays with time delay. These last may be of the thermal type (either adjustable or non-adjustable), in which the time delay is inherent, or of the plunger type, in which time delay is secured by a dashpot or bellows.

The fuse is the oldest form of overload protection and possesses a certain inherent time delay; i.e., it will not blow instantly at current in excess of its rating but, if this excess current is left on long enough, the fuse will blow. This time interval, however, varies considerably with the same rating of fuse made by any one manufacturer and the same rating of fuse made by other manufacturers. Due to this inconsistency in fuses, they do not give proper overload protection for motors.

The squirrel cage induction motor, the most popular motor in this country today, takes from five to eight times full load line current when started on full voltage, and, even when started by means of a compensator or resistance type starter, takes two or more times normal current. Thus, any fuses protect only against short circuit in such service unless a double-throw starting switch is used, and even then the chances are that the constant blowing of a fuse will result in the use of larger fuses until, eventually, no overload protection is provided.

On slip ring motors and direct current motors a fuse of about 125 per cent full load motor current is used and is



Above are shown three views of an overload thermal cutout. The left view shows the spring and the contact post of the heating coil held together by the fusible link. To right is the same with cap on. Center shows link melted off

generally satisfactory in starting, but the same general statement applies; i.e., the constant blowing of a fuse on overloads will result in the substitution of a larger fuse. Although a fuse does not give proper overload protection for a motor, it does give very good short circuit protection and is, therefore, well adapted for use in conjunction with other types of motor protective devices.

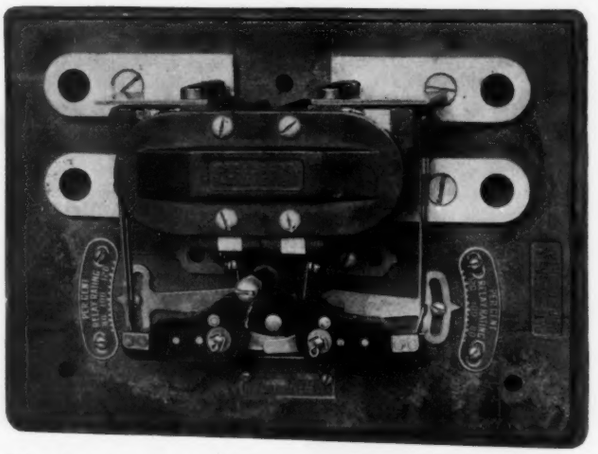
The second form of protection is the overload relay with instantaneous trip. This trip is usually set at 160 per cent full load current and should only be used for special applications where the device must be stopped instantaneously at a certain load.

Overload Thermal Device

THE overload relay with time delay is the third form. On squirrel cage induction motors, this must be set so high as not to trip under starting conditions, and this setting is usually 125 per cent of full load. On direct current and slip ring motors a setting of 110 per cent full load generally takes care of the starting conditions. It may be pointed out here that this type of relay has both a current setting and a time setting, and frequently these two are confused. Properly applied and adjusted, this type of relay gives good motor protection.

The fourth type is the thermal device, which is the latest form of motor protection. Motors driving loads requiring high starting torque, such as on cranes, hoists, rolling tables, etc., must have very large fuses or high settings of relays, which means that short circuit protection only is provided. Further, every motor is capable of carrying a heavy overload for a short period of time and this period is longer than that given by the commercial form of instantaneous or time delay overload relay. If the relay is set high enough to preclude operation on the short time overload the motor can stand, it leaves the motor without adequate protection in case of a prolonged overload which would not trip the relay but be sufficient to burn out the motor. As long as a motor performs its duty and does not reach a dangerous temperature, there is no reason for disconnecting it from the line, even if it should be carrying overload for a time. It is evident that a motor which is just starting up and is cold can carry an overload for a longer period of time than the same motor could if this overload occurred when the motor was already hot. The commercial form of instantaneous or time delay overload relay cannot take these points into consideration.

An ideal form of relay would be one that follows the thermal characteristic of the motor very closely. Thermo-



The above is a double element relay for use with motors taking from 20 to 300 amps. at 600 volts. With current transformer it can be used on any capacity A. C. circuit

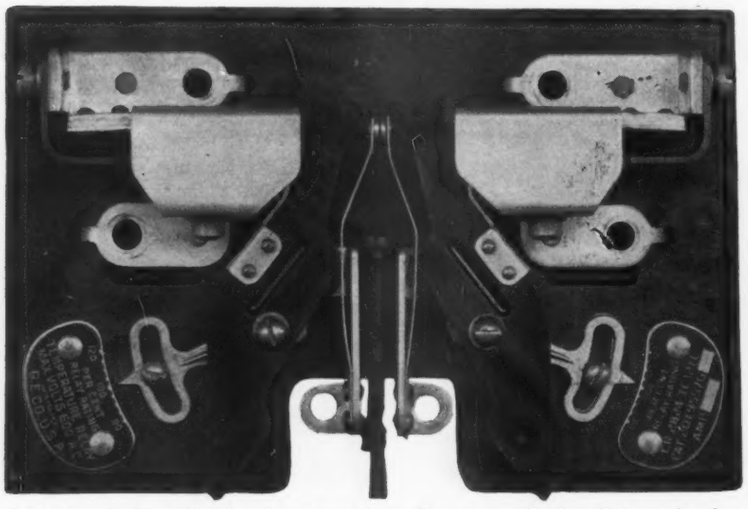
couples in the motor winding meet this requirement very well but are too expensive except for the larger sizes of machines. The thermal devices just mentioned under the fourth group come nearest to fulfilling these requirements. There are two forms of this relay; non-adjustable and adjustable. A non-adjustable form is the thermal cutout. There are two forms of the adjustable device. The cheaper is one in which the current to the motor flows through a coil, heat from which is radiated to a strip of metal which expands and trips the device. This relay follows the heating of the motor quite closely during ordinary operation. The other form is made of two elements, the one a mass of iron corresponding to the iron in the motor, the other a heating element corresponding to the windings of the motor. The operation of the relay is dependent upon the expansion of a strip of metal which, due to the above arrangement, follows the thermal characteristics of the motor extremely closely. These thermal devices are not suitable for short circuit protection, but, used in conjunction with fuses back in the line, give the best form of protection.

Fuse Ratings and Conductors

THERMAL cutouts are now furnished with a marking indicating the maximum rating of fuse with which they can be used. If the fuses in the line exceed this rating, it is necessary to add a set of fuses which will come within this value to give short circuit protection.

Magnetic switches are becoming increasingly popular because of their simplicity of operation and convenience in location.

The next point to be considered is the selection of wire between the mains and the motor. A squirrel cage induction motor draws a large current during starting. This current decreases as the motor comes up to full speed, but the decrease is not rapid until the motors have increased in speed to approximately 60 per cent of full load speed. As the fuse or overload relay setting is dependent not only on the current but also on the time, it can be seen that, on a load requiring heavy starting duty, the motor will not accelerate as quickly as one having a light starting duty. Therefore, on the former, the large current will last for a longer period, necessitating a larger fuse than on the same motor handling a load having a light starting duty. This, in turn, means a larger size of conductor must be used between the mains and the motor.



This is a double coil relay for use with small motors. Each coil has a heating element which transmits heat to its thermostatic strip. When overload occurs, the heat causes the thermostatic strips to deflect

Making Production *Flexible with* CONVEYORS

How a building was adapted to a use for which it was never intended and the trucking force reduced 95 per cent

By D. B. Kift

General Superintendent,
Edison Electric Appliance Company

This circular, gravity roller section of the conveyor was installed around a building column because, in this position, it required less usable space. It carries material from the third floor to the basement level

WE had come into the possession of a building which was not built for us and so was not, in many respects, particularly adapted to our needs. One of its shortcomings concerned the means of getting materials, parts and finished products from one floor to another.

We worried along with the single elevator with which the building was equipped and employed truckers in each department who delivered material to the other departments. But this arrangement, with the increase in business, soon became intolerable. So, we were confronted with the question so frequently met throughout the industry, "What should we do about it?"

There were two alternatives. One was to install a second elevator, and the other to put in a complete conveyor system that would encircle the entire building and serve all departments on all floors. We decided upon the conveyor because we found that it could be installed for only a little more than an additional elevator would cost. Adding elevators to a concrete building after it is built is not an inexpensive undertaking. Besides, if we had put in the additional elevator we still would have had the truckers on our payroll. With the new conveyor, we have done away with fully 95 per cent of our trucking. In fact, the only trucking we now have is within the department or in the case of pieces too large for accommodation in our standard tote box which is used on the conveyor.

The results we have obtained in the five months that this conveyor has been in operation convince us of the wisdom of our choice of this way out of our dilemma. Briefly, the conveyor system is a series of flight, belt and gravity roller conveyors forming one continuous encircling route covering each of the six floors and basement of the main building and a two-story building adjoining it.

All material is conveyed in wooden tote boxes, 3 ft. long by 1½ ft. wide, and 8 in. high. This we decided was the best size for our purposes, everything taken into consideration, and so we standardized on boxes of these dimensions. It is true, as will come out a little later on, that this system forces us to keep to a standard box to the exclusion of all others, but we believe that this is an advantage rather than otherwise.

For a box to make the complete circuit of the system and back to its starting point (were it to be left on the conveyor all the way around) takes about twenty minutes. Wherever, on its course, it is desirable to lead material or parts to a particular department, gravity-roller spurs branch off. The boxes are made to take these branches entirely automatically. This is accomplished by upright metal pins placed in holes in both ends of the tote box. These are engaged by overhead deflecting strips as one of the accompanying illustrations shows. There are at present thirteen holes allowing that many different spur selections, but more may be added at any time.

As rapidly as possible, we are placing pin-holding attachments on all of our boxes so that shortly the entire supply throughout the plant will be so equipped. Then, there will be no necessity for transferring material from one box to another to make it available for use with the conveyor. Obviously, material must not be piled so high in these boxes as to interfere with the operation of these de-

The hinged section of the main line conveyor seen in the illustration above is located in the inspection department. This section is raised to block the main line until the boxes have been inspected. The box at the right is on a section of the conveyor mounted on scales

flecting pins. But there is little danger of this, for material piled that high would not follow the inclines without spilling.

Every spur is made long enough to accommodate a number of boxes. In this way, there is little danger of the boxes filling the spur and backing up onto the main line, thus clogging the whole system. The removal of the boxes from the spurs is a responsibility assigned to bench workers and others who are employed close at hand. Thus there are no "overhead" employes whose sole duties are to serve the conveyor.

A certain number of empties, without pins in place, are allowed to remain on the conveyor. Thus, they continue to go around on the main line, passing in front of workmen so as to be at hand when an empty is needed.

While some of these spurs are relatively short, others extend a considerable distance leading material and parts right into the midst of the group of operations where they are needed. In fact, it is this very feature which makes it possible to reduce, to the extent which we do, the amount of hand trucking now necessary. Parts going into assembly are placed on the conveyor in the stock room and the pins arranged to switch the shipment off the main line onto the spur which goes to the department where that particular assembly work is carried out.

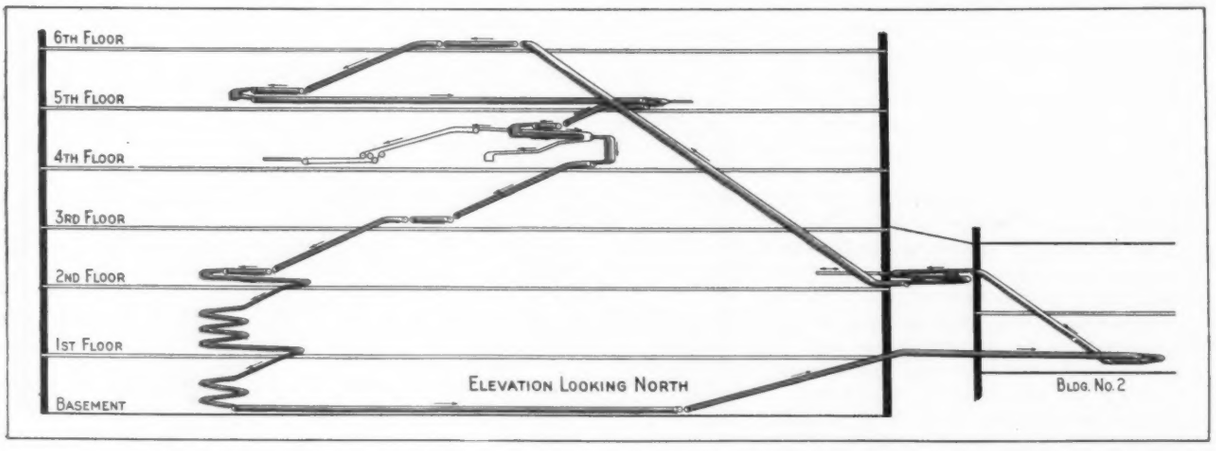
This occasions no rehandling in the stock room because parts are carried as far as possible in standard quantities in the standard boxes. Since they are kept on the stock room shelves in these standard boxes, it is a simple matter to fill a requisition as soon as it comes in by sliding loaded boxes right onto the conveyor.

After the product is assembled, it is packaged in a location close at hand and immediately sent by conveyor to the packing and shipping room or to the storage rooms right adjacent to the shipping department on the floors below. The conveyor which accomplishes this is a combination of straight roller conveyor feeding into a spiral chute. There are three of these leading from different assembly departments. They are quite independent of the main encircling conveyor system, although, of course, an important link in the complete materials handling arrangement of the entire plant.

While it is rather incongruous to refer to a circle as having any beginning or ending, there is one point in this main encircling conveyor which may at least be said to be the key or control position in the complete circle. This is the inspection department. Here, there is a hinged section which forms a gate in the conveyor. When this section is raised it blocks the main line and holds the boxes back at this point until their contents shall have been properly inspected. This gate is clearly shown in one of the accompanying illustrations.

So that there will be no holding up of materials that ought to be going through on the main line, there are several spurs in the inspection department onto which the boxes may be pulled from the main line pending inspection. In the main line of the conveyor in this department is a section mounted upon a scale, so that weights and counts may be obtained without any lifting.

In this inspection department is afforded an example of the value of the endless feature of the system and of the pin-operated automatic switching arrangement, for, should certain parts fail to pass inspection and it be necessary



The elevation of the building looking north shows how the conveyor system serves all floors of the six-story building as well as the adjoining building. Standard size boxes are used throughout to carry materials from one section to another

to send them back for reworking, the box containing them is put back on the conveyor with the pins properly set to return it to the department from whence it came. Thus, there is no holding up of boxes awaiting a trucker, nor any "side tracking" as so often happens in factories where certain trucks or boxes seem to get into a sort of eddy current without finding their way down the main stream to their destinations.

In the basement, where the main line of the conveyor starts its upward climb to the top floor, there is an easy incline where a belt goes first to the punch press department in an adjacent building and then continues on to the upper floors back in the main building. It is here that there is a unique application which well shows the flexibility of the entire system.

The tote boxes are supplied with pin-holding attachments and movable pins so that they can be switched off automatically to any spur. The pins are placed in the proper holes at the starting point and a piece of angle iron suspended above the conveyor deflects the box

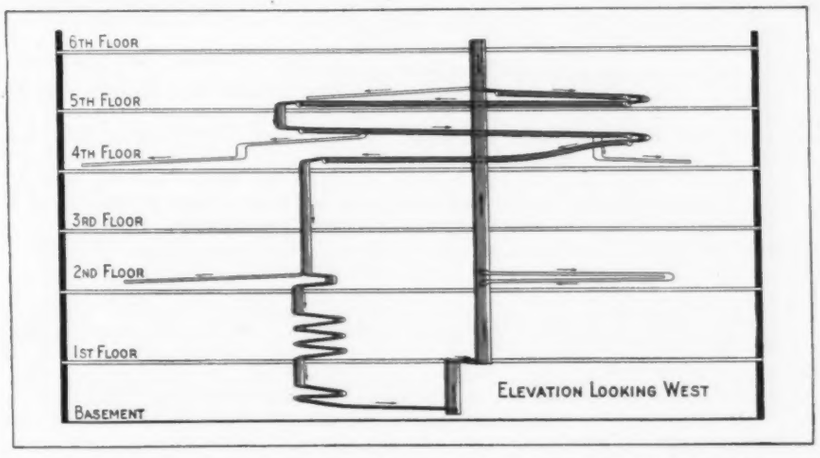
As just mentioned, this is an easy incline, and furthermore the change in elevation from the level to the inclined section is very smooth so that it is possible to accommodate boxes of strip and rod steel, which are between ten and twelve feet long. These are carried on the incline between the steel storage department and the punch press department. So that these long boxes will not come unannounced, and therefore go on through the punch press department and later block the entire system, the punch press department is telephoned to be on the lookout for them as soon as they are placed on the incline in the storage department.

A further example of the flexibility of the system is illustrated by the fact that this particular inclined section is arranged so that the direction may be reversed when it is desirable to bring back certain materials from the punch press department to storage. Of course, when this is being done, boxes on the main system are temporarily blocked, but only in the particular part of the system just prior to this basement incline.

As was mentioned early in this article, and as has probably become evident to the reader from the illustrations and the text, this system is built up in its entirety of several different types of conveyor. There are, for instance, inclined belts and level belts, straight sections of gravity rollers, a short section of steel chute, and from the third floor down to the basement level, a gravity spiral. Nor are the conveyors installed at any standard level. Some are up near the ceiling, others at about bench height, and still others almost at floor level, depending upon the convenience in each case.

This gravity spiral is interesting because it is located around one of the building columns and so consumes very little usable space. Since no service is required of the conveyor, the spiral offers an excellent way of dropping past that floor at a minimum of expense of space.

As frequently occurs where innovations are introduced in a factory, whatever difficulties are encountered are more apt to be with the human element than with the equipment itself. We have not experienced many obstacles in this regard, but we do now and then find a truckload of boxes being wheeled onto the elevator. It all comes back to the fact that new equipment, whatever its nature, must be thoroughly sold to the people who are to use it. When this is done it is relatively easy to prove in the equipment itself in most cases, after which little or no trouble will be experienced. The human element must be considered, however, in order that the whole system may work efficiently.



The conveyor system is continuous so that boxes left on the track will be carried around the system again and again. Empty boxes are left on the track in this manner so that they will be available when a workman in any department needs one or more of them

While it is true that we have superimposed this encircling conveyor system upon a plant which was not adapted to our needs and, furthermore, a plant which was fully operating at the time the conveyor installation was made, I am not at all sure that were we starting a new plant from the ground up, as far as the conveyor goes, we would not install it to cover just about the same ground that it now covers, and to serve just about the same purposes. Perhaps this is a fitting testimonial to the value of conveyors, particularly as to their flexibility under a wide range of conditions.

What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

NEMA Representation on Electrical Committee

NEMA has appointed the following members as representatives on the electrical committee of the National Fire Protection Association, and the sectional committee of the American Engineering Standards Committee:

H. R. Sargent—C. A. Bates, Alternate.

C. L. Abbott—J. A. Wahlgren, Alternate.

C. L. Kennedy—W. H. Harrington, Alternate.

R. H. Manson—Frank Thornton, Jr., Alternate.

R. W. E. Moore—L. F. Adams, Alternate.

Chicago Radio Meeting Will Stress Merchandising

A program of subjects and speakers which should make all members of the Radio Division rush to the nearest passenger agent for Chicago reservations has been scheduled for the annual meeting of the division, to be held June 4-7 at the Drake Hotel, Chicago, as announced by Louis B. F. Raycroft, vice-president in charge of the division.

C. W. Hough, president, Wired Wireless, Inc., will address the first general session Tuesday afternoon on "Wired Radio"; "Television" is the subject of a paper to be presented at the same session by Dr. Herbert E. Ives, special research engineer, American Telephone & Telegraph Company, and Alfred E. Waller, managing director of NEMA, will talk on "Provincialism in Industry."

The second general session, Thursday afternoon, June 7, will be opened with an address by Dr. Alfred N. Goldsmith, chairman of the NEMA legislation committee, chief broadcast engineer of the Radio Corporation of America, and president of the Institute of Radio Engineers. Dr. Goldsmith will talk on "Cooperation Between the I. R. E. and Manufacturers' Associations." R. H. Manson, chairman of the Nema radio technical committee, and chief engineer of Stromberg-Carlson Telephone Manufacturing Company, will follow Dr. Goldsmith, speaking on the "Effect of Standardization on the Radio Industry."

Various aspects of merchandising are scheduled to receive considerable emphasis at three evening meetings of the Merchandising Council, to be held on Monday, Tuesday and Wednesday. Thomas F. Logan, president of Lord & Thomas & Logan, and chairman of the radio committee, American Association of Advertising Agencies, will speak Monday evening on "Radio Advertising." F. M. Nicodemus, treasurer of the Commercial Credit Company, will tell about "Radio Time Payment Sales." Other subjects to be presented during these meetings include radio sales and advertising costs.

Meetings of the transmitter, vacuum tube, and power supply sections with their various working committees are scheduled for Monday afternoon, Tuesday and Wednesday mornings, with additional meetings of the receiver section on Wednesday afternoon and Thursday morning. Section officers will be elected at these meetings.

Group luncheons and dinners have been arranged for each day, with the annual banquet set for the evening of Thursday, June 7.

Industrial Lighting Section

Arthur Miller has been elected chairman of the industrial lighting section, formerly the industrial and street lighting section. The Board of Governors has also approved the division of the industrial lighting section into two groups—the metal reflector group and the glass group.

Vulcanized Fibre Pamphlets

The vulcanized fibre section has shown an interest in its standards to the extent of ordering 30,000 eight-page pamphlets containing the standards previously appearing in the Supply Hand Book.

Welding Section Gives $3,750 Toward Research

The electric welding section of NEMA has contributed a sum of $3,750 to the National Research Council for the purpose of (1) developing the welding technique for steel structures along the same lines as riveting technique has been standardized, and (2) to furnish the building code committee of the American Welding Society with such data as will enable definite recommendations to be made for the incorporation of welding requirements in building codes.

House Committee Hears Waller on Government Contract Bill

Alfred E. Waller, managing director of NEMA, addressed the Judiciary Committee of the House of Representatives, Washington, D. C., March 30, on the subject of Bill H. R. 5767, covering the establishment of uniform requirements affecting government contracts.

Mr. Waller spoke in behalf of the association for the preservation in its original form of Section 9, covering liquidated damages, keeping the question of remission of liquidated damages in the hands of the head of the department concerned.

He also suggested the insertion of a clause to this bill, making the Attorney General the definitive law interpreter for the government departments.

Standards Committee News

The standards committee has approved the appointment of Harvey Hubbell, Harvey Hubbell, Inc., and Frank Thornton, Jr., Westinghouse Electric & Manufacturing Company, as members of the committee representing respectively the Supply and Appliance Divisions.

The chairman of the committee was authorized to appoint a joint sections committee representing the knife and inclosed switch section and the industrial control section for consideration of the standard for motor circuit switches.

Fred B. Adam has been appointed by the standards committee as representative of the panelboard and distribution board section on the joint committee on definitions, abbreviations and nomenclature, replacing R. C. Graves.

A joint section's committee, consisting of representatives of the interested sections of the Radio Division and the snap switch section, has been appointed to review the question of standardization of position of toggle snap switches.

G. I. Gilchrest, Westinghouse Electric & Manufacturing Company, has been appointed a representative of the electrical porcelain section on the disconnecting and horn gap switch committee.

Carbon Section Reorganizes

Convinced that the problems of carbon manufacturers could best be met through cooperation in order to develop the business on a sound basis, eight companies manufacturing carbon were represented at the first meeting of this section, March 30, at NEMA headquarters.

E. A. Williford, of the National Carbon Company, was elected as chairman.

At this meeting were present: F. P. Fuller, Graphite Metallizing Company; Lyle G. Hall, Stackpole Carbon Company; W. H. Hardman, General Electric Company; A. S. Harvey, U. S. Graphite Company; Walter S. Hoyt, Pure Carbon Company; H. C. Mills, Morganite Brush Company; Paul R. Roberts, Le Carbone Company; and E. A. Williford, of National Carbon Company.

The section is making a comparison of methods used by the different companies in determining production and sales costs.

Do You *Need* ELBOW ROOM and BREATHING SPACE?

Room for Growth — *Cheaper Land* — *Lower Overhead* — *Cheaper Power* — *Permanent Employees*

Lower Payroll — *Lower Taxes* — *Easier Shipping* — *Cheaper Warehousing* — *Greater Efficiency*

THE average small American city or town offers electrical manufacturing plants many advantages over locations in metropolitan areas. As congestion increases in the larger cities, industry comes more and more to realize why the small town location, in many cases, is preferable.

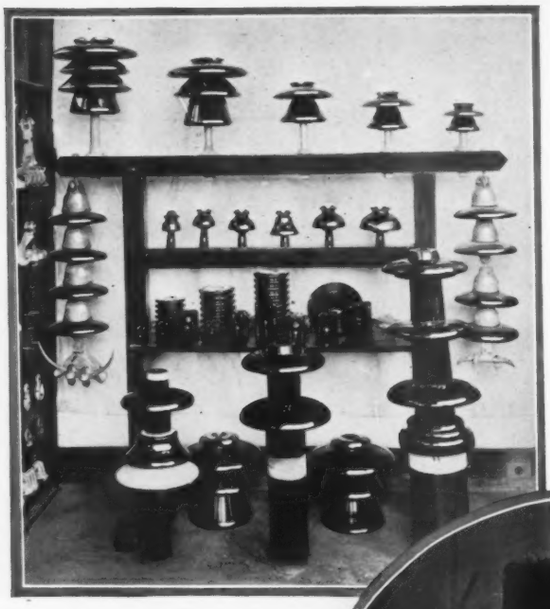
While the so-called "drift to the cities" has been in progress, things have been happening in the country, too; chief among which are the widespread distribution of electric power and the development of better facilities for faster transportation.

A MANUFACTURER who locates his factory away from the congested centers of population is justified in expecting lower costs and greater productive efficiency. Fast freight and good roads have placed the small town in close touch with raw materials and markets. Land is cheaper, taxes lower, shipping facilities less crowded, and room for expansion plentiful in the small city or town.

These are some of the many reasons why manufacturers are awakening to the desirability of placing their factories in less crowded environments.

Maintaining a High Sta in Every Electrical Po

PRACTICALLY every step in the making of electrical porcelain products involves some considerations which must be watched carefully in order to insure the necessary high standard of quality in the resulting material. The illustrations on this and the following page show how porcelain insulators are made in the Emeryville, Cal., insulator plant of the Westinghouse Electric and Manufacturing Company



ABOVE are some of the porcelain insulators made in this plant for use on transmission and distribution lines. At the right the general foreman is shown making an insulator model from which plaster of Paris molds will be cast. He must allow for changes due to drying, etc.

THE clay mixture must be of the proper consistency and contain the desired materials. The man below has supervised the mixing of the clay which he is shown removing from the storage cellar

EVERY insulator shape requires some special hot press tools. At the left is shown a workman checking a hot press tool for a new insulator shape to be used in a suspension string

IN the pressing of suspension insulators on the machine shown at the right, the tool must be kept at the right temperature, the clay blanks must be correctly shaped and placed in the molds in order to insure uniform products

Standard of Quality Porcelain Product

THE forming of the clay into the proper shape completes part of the process but, if proper precautions are not observed in each of the remaining steps, the high electrical and mechanical strength of the porcelain will not be obtained. Each man must be reliable and do his work accurately if the final tests are to show a minimum of rejections of the finished insulators and other products

THE surface of the clay in contact with the hot press tool is perfectly formed but the back must be formed by hand as shown above. The man below checks assembled insulator strings. He is shown spraying the cement joint of a 70-kv. string with waterproofing compound

THE man in the illustration at the right is just finishing the application of porcelain sand particles on the freshly glazed surface of an insulator. These particles fuse with the glaze in the kiln and form a rough holding surface for cement

BUSHINGS and tubes are formed as shown at the left by turning large hollow cylindrical clay blanks. The workman is shown finishing part of a 37-kv. bushing

THE firing cycle is completed in five days and the maximum temperature is reached on the third day. The man at the left watches the temperature indicators and regulates the oil burners so that all parts of the kiln receive proper heat

Clean Up and Light Up

An Ice Cream Plant

To the right is pictured an ice cream plant brilliantly illuminated at night. Certainly this building itself thus becomes a sales argument in behalf of the product made therein.

Above is a plumbing fixture plant which has its front lighted for hundreds of yards

Steam Laundry Building

Below is a steam laundry so floodlighted as to make it stand out against the night. Is there any good reason why the cost of such illumination should not be charged against the advertising appropriation, along with the cost of other forms of promotional publicity?

A Wide Awake Dairy

No shadows hide the front of the above dairy at night. The architectural beauty of the building becomes a master salesman for all of the twenty-four hours, by means of its fine illumination from sunset to sunrise. This attracts more business, of course

A Motor Car Company

The motor car factory administration building to the left is lighted in such a way as not only to make the building stand out brilliantly, but also to silhouette the shrubbery around it. This leaves an indelible picture in the memory of the chance passer-by, who may also be a prospective customer

Show us an electrical manufacturing plant which deserves to be and is floodlighted at night! Above are some excellent illustrations indicating how other industries have gone in for this type of publicity. For years the electrical industry has preached floodlighting to concerns in other fields and has made and sold illuminating equipment for that purpose. But the industry itself has set a poor example to those outside it. It has neglected to practice what it has preached. It pays to keep a neat and clean plant. It pays to illuminate it thoroughly and attractively at night. People patronize well-housed concerns. The product is not the only factor which decides where a customer shall buy. And where plant floodlighting is a good advertisement for the ordinary concern, it is ten times more so to the electrical manufacturer whose industry makes the lighting equipment

Applying Insulating Materials to Coils and Windings

No. 1 of a Series on Insulating Varnishes and Impregnating Compounds

Different applications require different kinds of insulating varnishes and impregnating gums to give the desired results under service conditions

By D. H. Braymer
Consulting Engineering Editor,
Electrical Manufacturing

AND

A. C. Roe
Renewal Parts Engineering Department,
Westinghouse Electric & Mfg. Co.

IN every electrical device in which coils are used consisting either of a few turns of wire or a large number of turns of wire, insulation is required. This insulation must be mechanically strong and it must also provide dielectric strength as an insulator, between the turns of the coil and between the coil itself and the metal parts of the machine, whether it be a motor or other mechanical or electrical device in which the coil is used.

The construction of any type of coil requires the use of organic materials such as paper, cotton, silk, fibre and inorganic materials such as asbestos and mica or a combination of these two such as mica and fishpaper, cambric and mica, etc. Many of these materials are applied in the form of tape, cotton and silk coverings on copper wire and as wrappers. All must have the property of ease of application and good tensile strength. Most of these materials when untreated, however, are lacking in high dielectric strength and are used as a separating and supporting medium for materials that have high dielectric strength but low mechanical strength.

The materials used to provide this high dielectric strength are insulating varnishes, shellacs, asphalts and resins or combinations of these with various drying oils and solvents to give the characteristics that will meet the requirements of operating conditions. The high dielectric strength materials mentioned can be applied in the form of a liquid which will turn into a solid after application and proper processing.

Removing the Solvents

INSULATING varnishes and compounds in various combinations all contain a considerable amount of volatile solvents which must be excluded or driven off before the maximum usefulness of the base can be obtained. It is often extremely difficult to drive off the solvent from the interior of large coils having a large number of turns or a large cross-section. Even if it were possible to completely remove all of the volatile solvent, the passage of this solvent will leave the coil full of pores when the process is completed. It is for this reason that varnishes or shellacs cannot always be used to provide dielectric strength for coil insulation and an impregnating compound is required to fill up and seal the pores of the coils and the insulating coverings or protections used on or over the wires.

The term impregnation as used in the electrical industry for the treatment of coils and windings should be restricted to vacuum impregnation. When coils or windings are treated with varnishes or insulating compounds by dipping and baking methods, the term dip and bake should be used. This is a distinction that should be observed when electrical apparatus is sent out to a local repair shop for repairs or rebuilding. A vacuum impregnating outfit is expensive to install and maintain but for certain classes of work and service conditions, impregnation is superior to the use of varnishes applied by dipping and baking. Consequently, a vacuum impregnated piece of repaired apparatus will command a higher price.

Since the most generally used method of improving the dielectric strength of coils and windings is by applying varnishes by the dipping and baking process, the selection and application of varnishes will be taken up first, followed by a discussion on impregnating compounds by the vacuum impregnation process.

Consistency Judged by Specific Gravity

AN insulating varnish must have a high dielectric value wet or dry, both as regards ohmic resistance and disruptive strength. The varnish used should have a consistency and viscosity that will make its application uniform and should contain the largest possible amount of base or useful material. The drying should not be too difficult nor costly nor at too high a temperature. The coating when applied and dried should be adherent, binding and mechanically strong. It should not lose its electrical or physical properties even when subjected to continued action of heat in service or electrical stress. It must also be proof against oils, acid, alkalis or humidity which may be present in the surroundings in which the machine is used.

The various consistencies of a given varnish are most easily judged by the specific gravity. This can be measured with a hydrometer for liquids lighter than water. Like other liquids, varnishes expand as their temperature is raised and contract as it is lowered. Therefore the specific gravity must be measured at the same temperature, which is usually room temperature of 70 deg. F.

Since varnishes are made under definite chemical processes to secure reliability it is always advisable to secure a high grade, manufactured by a reliable firm and cooperate with that firm in the establishing of the characteristics best suited for the service conditions of the machine. The specific gravity of the varnish used should then be maintained at the value recommended by the maker or as found best suited by the user for his particular conditions from

experience with it. It is in no case advisable to keep changing varnishes and using many grades for the sake of economy, for a good grade of varnish is the cheapest in the long run.

A varnish thinned down with a high percentage of solvent will penetrate well but on drying the varnish film will be thin due to the fact that the amount of base material is low. On the other hand, a varnish with very little solvent will give a thick coating and will not penetrate well. This thick coat requires more time to dry. If such a thick coat is applied to a coil and not thoroughly dried and the coils are then inserted into slots which are close fitting, the film will be destroyed with the result that there will be no insulation where it is needed. Therefore a medium bodied varnish is the best for general coil insulation with a specific gravity of from 0.840 to 0.870 Baume Scale, depending upon the base used and the length of time for drying and baking. The recommendation of the maker as regards drying time is the safest to follow after providing the service expected from the particular user.

This article is the first of several on the subject of insulating coils and windings to be written by Mr. Braymer and Mr. Roe. Very little clearly written information is available on the properties of insulating varnishes and impregnating compounds and the readers of ELECTRICAL MANUFACTURING will find this and the coming articles of the series of exceptional value. Future articles will discuss the correct methods of applying dipping and baking varnishes and impregnating compounds and their advantages and disadvantages for different applications. The next article will treat the application of dipping and baking varnishes to a particular class of coils for particular service conditions.

THE EDITOR

In general, it has been the experience of the writers that the varnishes selected must be suitable for treatment of coils after winding and before applying the final insulation and also for the final treatments after installing the coils. It is also the opinion of the writers that varnish for coils should preferably be a black plastic baking varnish, one that will dry giving a tough plastic coat which will harden and not soften under heat.

Black Plastic Baking Varnish

THERE are a number of such varnishes on the market and the reason for stating that the black plastic baking varnish should be selected is that the clear or amber varnishes dry hard and, after being exposed to the air for any length of time, the varnish and material filled with it becomes brittle. That is, the cotton sleeving used as coil lead covering becomes so hard and brittle that cracks open when a sharp bend is made. These sharp bends must be made, as it is necessary in most cases to either bend the bottom leads down or the top leads up when connecting the winding. This hard film also prevents the repairing of the armature or stator. When lifting the throw coils to remove a defective coil, this operation will crack the insulation on the coils bent up at a point near the iron, which will cause other failures.

On the other hand, the black plastic varnishes are not fully oil proof and there are operating requirements that require a finished coil or winding to be oil proof. On transformer coils that are immersed in oil, the black plastic varnish would soon dissolve, whereas an amber varnish would stand up better. Likewise the right amber varnish would render a wound stator highly resistant to oil for use on automatic screw machines, etc. The repair shop, therefore should have at least two dip tanks, one for a black plastic varnish and the other for an amber or clear baking varnish.

A heavy varnish for first dippings of wire wound coils will give trouble with subsequent operations, as the sleeving on leads at the end of slot sections, coil ends, etc., becomes heavy and causes wrinkles in the wrapper or finishing tape.

When armature or stator coils are subjected to mechanical strains that tend to cause movement of the individual turns in the coils, such as motors subjected to frequent starting and stopping or reversing or across the line starting, then an amber varnish should be used for the first dips with this caution if the best results are desired. First, be sure that the coils will wind in the stator or armature with very little pounding or shaping. Second, bind the wires in the slot sections and ends in a rigid manner, using tape, string, etc., before dipping. This is necessary to obtain the full cementing qualities of the amber varnish which can be broken after drying by unnecessary pounding.

The most suitable materials for vacuum impregnation are the asphalts and resin compounds. These can be liquefied by heat and forced into the coil, and when allowed to cool a hard solid coil is the result. The wires are held in a compact mass, thus resisting the radiation of heat from the inside of the coil. The compounds fill all of the pores in the insulating materials used in the construction of the coils and, also, any of the small spaces in the coils, thus increasing the dielectric and mechanical strength of the coil itself. The finished coil is made moisture proof and, if suitable compounds are used, the coil can be made to resist higher temperatures and the action of acids and other corrosive agents.

Impregnating compounds, like varnishes, should be selected to meet the requirements of the coil in its application. A compound having a melting or drop point (Columbia Method) between 116 to 128 degrees C. (240.8 to 251.6 degrees F.) is satisfactory for most applications. The problem of any coil maker or repair shop having one impregnating outfit is to select a compound that will meet most operating conditions, since the storage and mixing tank which is a part of the outfit holds quite a large quantity of compound and it is impossible to change compound without considerable expense.

Oil Proof Compounds

SUCH windings as arc blow out coils, holding coils, brake coils, coils used in auto-starters or compensators require a high melting point gum. Compounds having high melting or drop points are, however, apt to be more brittle and cannot be used as an all service compound. One bad effect of high temperature gum is that if rubber covered cable is used on the impregnated object, it becomes lifeless, hard and brittle and will crack if bent. On the other hand, all asphaltic compounds are more or less soluble in oil, hence are not suitable for impregnating coils that must be used in oil, as in oil cooled transformers.

To take care of all operating conditions, therefore, at least three impregnating tanks are required, which is too expensive for practical use outside of large plants.

Oil proof compounds are all composed of resinous gums compounded in such a way as to provide the required properties, such as melting point, hardness and penetrative power. Some use castor oil, linseed oil or other vegetable oils. Any of the impregating compounds leave the surface of the impregnated winding full of lumps of hard compound that must be cleaned off. This can be accomplished on field and armature coils by applying a layer of gauze tape 0.017 in. by 1.5 in. wide. This tape has a strong open weave which allows the compound to penetrate. Then after the impregnating operation this gauze tape is removed, leaving the object free from lumps and smooth. Where it is not practicable to apply the gauze, or stripping tape as it is called, the lumpy residue must be scraped off.

Plant Engineer and Department Heads Must Cooperate in Plan for

SUCCESSFUL *Motor Maintenance*

Frequent conferences with section heads and foremen bring out ways in which the plant engineer's department may increase its service and help each division in the plant

By F. A. Westbrook

WHEN considered from the standpoint of keeping a plant in a state of efficient operation, the function of the plant engineer is similar to that of a public utility—he has a definite service to sell to the various manufacturing divisions. This is the view held by Mr. W. J. Crockett, plant engineer, of Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn.

He feels that it is necessary to cooperate in every way possible with all department heads and foremen, in order to keep things running smoothly. An understanding of just how this cooperation is actually carried out in practice may be obtained from a description of the way in which the motors are maintained. That the methods used are effective is demonstrated by the fact that there has not been a single shutdown since 1918 more serious than one necessary for the replacing of fuses. The plant engineer's department is divided into several subdivisions, each headed by a foreman and covering the functions of millwrights, carpenters, plumbers, electricians, etc.

It has been found from experience that weakness in a motor will generally show up in the morning when the heavy load due to starting the large machinery must be carried. If this critical condition is successfully met, without any signs of incipient trouble, there is not much fear for the rest of the day. Consequently an experienced man is detailed to make the round of every motor every morning. He starts in a little before the general opening time, when some of the largest motors are started so that the machinery will be running when work begins. This man inspects each of the 130 two-phase induction motors in the plant. He tests with a lamp to see that both phases are carrying the load and, by listening and placing his hand on the bearings, he makes sure that no other troubles are present. This, of course, is done as quickly as possible and takes only about two hours.

Such a hurried inspection as this naturally would not be enough, but when this is done in conjunction with a regular weekly inspection, it has been found that shutdowns need never occur due to any cause which could be prevented by proper maintenance. The regular weekly inspection is made every Saturday afternoon, when each motor is carefully examined, oiled if necessary and adjustments made, perhaps based on observations made during the morning rounds. In addition, all motors are gaged once

REMOVAL CARD

Machine No. 6000 moved June 20 1925

From S.A. Sec. No. 104

To E.A. Sec. No. 318

Remarks: Move Sat. aft.

Foreman

Form F-93

Figure 1. The card above is signed by the foreman of the department from which a motor is to be moved

MACHINE No. 6000 Date Mar 1, 1922

Type 50 H.P. Motor

Maker G.E.

Countershaft – Yes – No

Building S.A. Floor 1 Dept. 61 Section 104

MOVED TO

Building	Floor	Dept.	Section	Date
EA	3	3-E-4	318	6/20/1925
"	"	"	"	"
"	"	"	"	"
"	"	"	"	"

Figure 2. The card at the right is made out when the machine is purchased. It is kept in the plant engineer's office and provides him with a means of locating any machine and telling where it has been used since its purchase

H.P.	Syn. Speed	Make	Winding Diagram	Application	Shop or Mill No.	Card No.
50	900	G.E.		Line Shaft	E.A.	18

Type	Frame	Poles	F. L. Speed	Volts	Form	Temp. Rating	F.L. Amp.	Phase	Cycles
O.K.			860	220			108	2	60

Serial No.
Model No.
Publication No. B.T 6000

BRUSHES
No. Per Motor
Cat. No.
Size
Material
Grade

LININGS
Front End, Cat. No.
Pulley End, Cat. No. 3" Bore

PULLEY
Diam. 14
Face 14
Belt Width 12
Bore 2 7/8
Keyway

COILS
(Cat. or Spec. No.)
Stator or Field
Main
Comm.
Comp.
Rotor or Armature
Coils
Bars
No. per Set

Mfr's Order No.
Our Order No.
Date of Order
Cost { Motor / Control

CONTROL EQUIPMENT

Type	Make	Pub. No.
40-50 Type #	(W) Auto-Starter 220 V-2 Ph. with fuse protection	

Connection Diagram

User: Fredericksen - 30, Kauser - 20
Location: E.A

REMARKS:

Figure 3. This card is in the possession of the electrical foreman. It gives data about the motor and controller which are needed by the electrical department only. The controller is considered as part of the motor so these data are recorded on this card

Figure 4. The back of the card in Figure 3 is shown below. Repairs on the motor and the various jobs on which it has been used are recorded

SERVICE RECORD

Date	Building	Floor	Driving	Drive	Tested H. P.

REPAIRS

Date	Condition	Due to	Repaired by	Cost

a month for clearance, which is adjusted when necessary. The contacts in the starting boxes are changed regularly every six months, except for a few motors operating under severe conditions, in which case the contacts are changed every two months. The plant engineer has found that with this close check on the motors and control equipment, it is easy to detect most irregularities long before they are serious enough to cause breakdowns. Due to the careful watch which is kept on each motor it is often possible to let minor difficulties go until the following Saturday afternoon inspection, when they can be corrected most easily.

Another practice, which is beneficial in two ways, is the making of a periodic check on the loading of each motor by means of recording instruments. This is done on an average of about once every two months. In this way an overloaded motor may be replaced by a larger one before it is damaged. If the motor is underloaded, it is replaced by a smaller one so that the plant power factor may be maintained as high as possible.

Here the cooperation between departments enters into the problem again. These changes of motors are never made until the head of the department affected is consulted and all data pertaining to conditions in that department are obtained. It is possible that the department in question was working light during the week in which the readings were taken. If conditions are expected to pick up within a week or two, it would be a waste of time and labor to change motors. If, on the other hand, the plant engineer finds that the particular department has been running on approximately the same production schedule for a few weeks and there is no prospect of this schedule being changed, the motor size is increased or decreased as demanded by operating conditions.

When it is found necessary to change a motor, the foreman of the department in question signs a removal card like the one reproduced in Figure 1. This card gives the plant engineer authority to move the motor. It eliminates all possibility of furture complaints and provides an authoritative record not subject to question and therefore conducive to harmony in the plant. The removal card is also the means by which the records in the plant engineer's office are kept up to date.

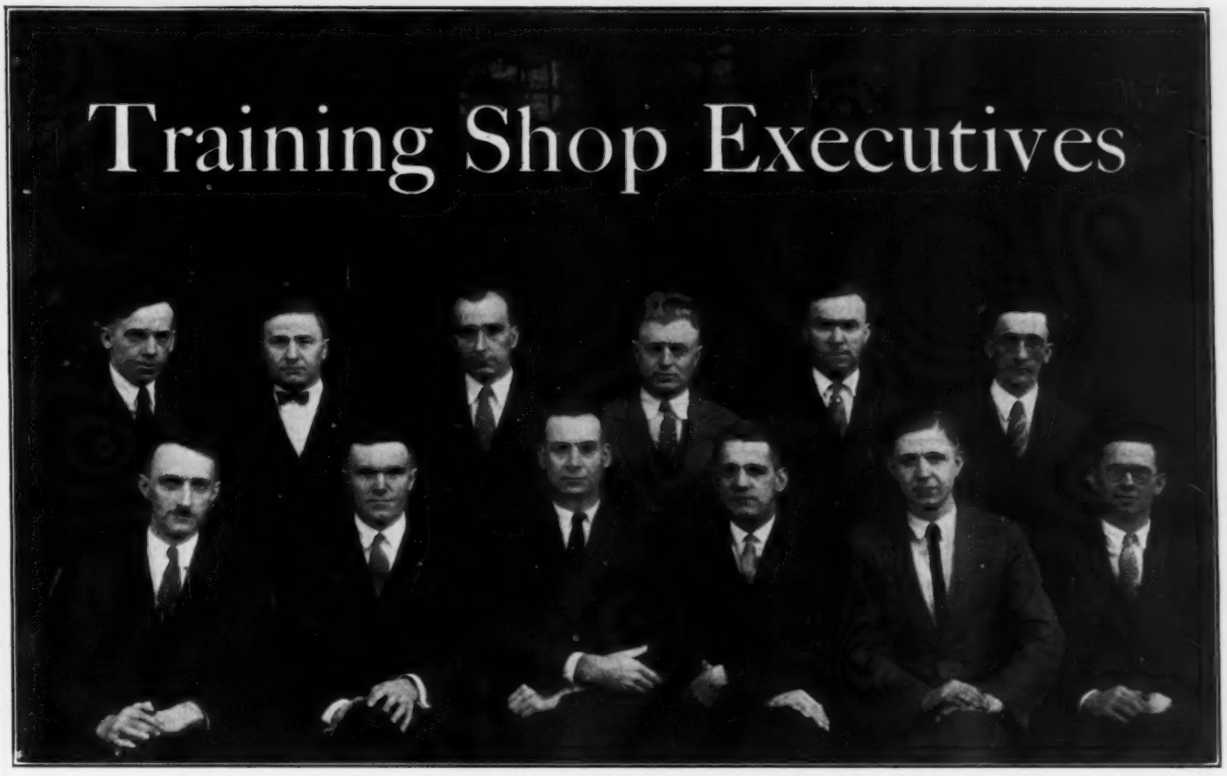
The records kept in the Colt plant are very simple and yet very complete. Before proceeding, it must be remembered that this description applies to every machine in the plant. No machine is removed or changed, except for repair, without a consultation with the foreman and a signed removal card. For the purpose of keeping records, each machine—lathe, press, drill, motor, etc.—is provided with a number when it is first purchased. This number is stamped on a brass tag and fastened to the machine. Each building and department has a certain code designation. The card bearing the machine number and its location is illustrated in Figure 2.

This card is kept in the plant engineer's office. He also has a cross index which consists of cards filled out according to the size of the motor. Thus, the card marked 50 hp. gives the numbers of all motors of that rating in the plant and, by looking at the machine cards bearing these numbers, the plant engineer can pick out an idle motor. Both the machine card file and the cross index have cards in them for other machines in the plant so that every piece of equipment can be located easily.

The electrical maintenance foreman of the plant engineer's department has in his possession a card, shown in Figures 3 and 4, which gives data that are needed by the electrical department but are not needed by anyone else.

Frequent talks with the department heads and regular conferences with plant foremen bring out ways in which the service may be improved and closer cooperation obtained. The department heads are brought to realize that the plant engineer's department is responsible for their maintaining schedules in many cases and that the various changes recommended are designed to help rather than hinder efficient production.

Training Shop Executives



There is no adequate source of men for executive positions in the manufacturer's shop sections, so he must develop leaders among his own shop men

By W. M. Emerson

Works Manager's Department,
Westinghouse Electric & Manufacturing Company

DOES training in an industrial plant pay? The profit minded manager may well ask himself this question. Building up an efficient, dividend-paying organization is as vital to production as fool-proof systems and mechanical aids, for, without men with adequate background to run the agencies of production, competitors will soon be in the foreground.

What are the needs for trained men in a particular plant, is the next question. Standardized mass production lends itself more readily to systematic control than does the manufacture of highly diversified products and can operate efficiently with a quite different form of organization. To make economically, and to deliver on short time dates, a varied and complex equipment requires supervisors with a wide experience in the many functions of the manufacturing process. In a large organization, cooperation among the various departments is fostered where the men can appreciate the problems involved in each other's work. Just as large banks often draw on the smaller country banks for their leaders, for the sake of the variety of their experience, so industry, too, needs broad gage men and having no reservoir of supply must develop them.

Each manager must look within his own plant to determine what is needed to give his leaders and potential leaders the necessary qualities to promote efficiency. A training program can then aid in developing these leaders more quickly and economically through providing the proper experience.

The following is descriptive of the various supervisory development programs in operation in the works department of the Westinghouse Electric and Manufacturing Company at East Pittsburgh. To manufacture a wide variety of highly special electrical equipment requires men efficient in all ranks of supervisory and technical work. Training, therefore, is comprehensive, including present supervisors, prospective supervisors and college graduates.

Supervisors' Course Given

TO meet a demand for future supervisors, about twelve practical men from the shop are selected each year and placed on a one year training course. Machining being a big factor in production, they are for the most part expert machinists. Men from other trades may be selected as required. If they have indicated to their superintendent that they possess the proper personal and managerial qualities they are recommended to the supervisor of training.

A workman on the floor who has spent most of his time in one section has ordinarily little knowledge of the company or of the function of the various departments with which the supervisor must deal.

To give them a more understanding view of the whole picture, all the men on the course are given a short and

Developing Men for Industry

Who *Title of Course*	Why *Reasons*	Whence *Sources*	When *Age*	What *Scope*	How *Methods*	Whither *Placement*
Trades Apprentice Course	Versatile Mechanics—Still Needed Foremen too Busy Better Training with Special: Place People Work	8th Grade Employes' Sons Shop Employes District Residents	16-20 Years	Total Time—4 Years Example: Machinist Shop Work—44 Hours a Week: Fitting, Drill Press, Lay-out, Shaper, Slotter, Planer, Boring Mill, Lathe, Milling Machine, etc. Class Work—4 Hours a Week: Shop Mathematics, Shop Drawing	Shop Work: Special Training Department—2 Years; Regular Shop Departments—2 Years Class Work: Regular Shop Men as Instructors, 15 Students per Instructor, Company Time	Trades Journeymen— Pattern Makers Tool Makers Machinists Electricians Printers
Intermediate Student Course	Practical-Theoretical Men Needed Supervisors Unable to Give Varied Training Broader Training—Available Thru— Definite Course Capable Instruction Varied Work Several Departments	High School Graduates From: United States, Foreign Countries	18-22 Years	Total Time—2 Years (According to Segregation) Shop or Office—44 Hours a Week: Scheduling—Planning, Machining, Assembly, Inspection, Time Study, Cost Class Work—4 Hours a Week: Self-Development, Industrial History, Industrial Management, Economics, Shop Mathematics, Shop Drawing	Shop or Office Work: Regular Departments—2 Years Class Work: Graduate Students as Instructors, 10-15 Students per Instructor, Company Time	Works Accounting Planning Scheduling Inspection Shop Time Study Supervisors
Works Graduate Student Course	Men Needed—Technically Trained with Potential Executive Ability Acclimate to New Environment and Industrial Problems	College Graduates	21-28 Years	Total Time—1 Year Practical Experience Shop .....2 Mon. Office: Scheduling and Planning, 3 Mon.; Cost, 2 Mon.; Time Study, 3 Mon.; Mfg. Eng., 2 Mon. Conferences Two—1 Hour Each—Weekly Industrial Problems	Shop and Office Work—Regular Departments Conferences: Special Leader, 10-12 in Group, Company Time	All Departments— Supervisors Time Study Scheduling and Planning Manufacturing Eng. Cost Accounting Cost Reduction Storekeeping Purchasing Inspection
Foremanship Development Course Future Supervisors	Leaders Needed with Shop Experience Broad Viewpoint Power of Analysis Industrial Knowledge Functions of All Depts. Quicker Development with— Special Training Variety Special Leader Conferences	Graduate Apprentices Intermediates Graduate Students Shop	25-30 Years	Total Time—1 Year Practical Experience Planning Scheduling } 3 Mon. Cost .....2 Mon. Rate .....3 Mon. Try-out .....4 Mon. Conferences Two—1 Hour Each—Weekly Self-Development Shop Problems Economics	Work in Regular Departments Conferences: Special Leader, 10-12 in Group, 1-2 Groups per Year, Company Time	Assistant Foremen in Shop
1 General Committee **10 Sub-Committees** Present Supervisors	Creative Thought Know the Company Express Ideas Develop Cooperation Broaden Knowledge Broaden Viewpoint Develop Leadership	Present Supervisors	25-50 Years	1 to 4 Years Conferences One—1 Hour Each—Weekly	Conferences Discuss Supervisor, Production Man, Cost Man, Rate Man, Inspector: Duties & Responsibilities New Employes Grading Employes Wages Systems Control Waste Cost Quality Transportation Working Force Economics	Improvement on the Job

These various training courses have been found valuable in helping executives to train men for their organizations throughout the plant. They must be regarded only as supplementary, however, for the structure of leadership must be built up right on the job with the benefit of the individual's work in the particular occupation he wishes to follow

intensive experience in each phase of the shop activities. For two months they are in the production department where they schedule and follow production through the shop. For two months they perform the different jobs in the cost department. During the next three and one-half months they are time study men, taking time studies, making time study formulas and applying time values. One month is devoted to inspection work.

It is well to correlate these experiences with discussions on shop and general problems which they encounter in their training. Accordingly they meet together for one hour twice a week to talk over any questions that may arise in the course of their work. The supervisor of training leads the discussions, aiming only to direct the trend of thinking and to lead each man to express himself. Thought provoking questions on all phases of factory management are also brought up by the leader. Heads of departments are invited in to talk about their organizations and their purposes. In this way many activities are explained in which the men do not directly receive training.

A valuable feature of these meetings is the group spirit that naturally develops. This is fostered through getting together a couple of times a year at a picnic and a bowling party where old friendships may be renewed. Also, the supervisor can really become much better acquainted with the men and more exactly determine their capabilities and aptitudes by meeting with them to talk over their problems than might otherwise be possible.

After a man has completed his time in the various works' departments, he is then placed on a regular job in the shop as a foreman, time study man, production man, inspector or in some other capacity and for the balance of the year has an opportunity to fit himself into that job. At the end of the training course he goes on as a regular man in this department. Later as circumstances arise he may be transferred to fill other positions.

Thus, by doing, they have learned. They have rotated from one department to another so that they know the whole organization. They have acquired contacts. At the two one hour weekly meetings they have discussed shop problems and matters of a more general nature. Most important, they have acquired a point of view and a wider vision which stimulates a closer cooperation between different departments due to a common understanding of each other's problems. Of no less importance, working in these various capacities has given them a chance to demonstrate their aptitudes and abilities so that a more satisfactory placement is possible.

Supervisors' General Committee

DEVELOPING practical men from the shop who have been with the company for several years creates a stable source of supervisory material. The turn-over is negligible. Those who have gone to night school and have acquired a good educational background have provided a source for general foremen and superintendents.

The school of hard knocks and experience is not displaced but supplemented through directed training so that men may acquire the proper background more quickly, more easily and less expensively.

Progressive supervisors feel a need for broadening themselves that they may be better equipped for their present work and better qualified for promotion. Eight years ago, an organization designed to meet this need was brought into being. A general committee was organized comprising fifteen men to head up this program. Ten sub-committees of thirteen men each were then formed. Membership is entirely voluntary. From the applications received, the general committee selects enough men to fill the sub-committees. These committees meet one hour each week.

The purposes of these meetings, as expressed by the members, are: to develop creative thought; to develop ability to express ideas; to develop cooperation; to acquire a knowledge of the company; to develop a broader viewpoint and acquire greater knowledge; and to develop greater leadership.

In order to carry out these ideals it is believed that the discussion must be of a real interest to all members and must be participated in by all members. The general committee therefore chooses its own topics. Each week the chairman of the committee prepares questions on one of these topics as a guide to the trend of the discussion for that meeting. These questions are in turn discussed the next week in each of the ten sub-committees for which ten members of the general committee act as chairmen. From the secretaries' reports the data are compiled and published each year in a pamphlet entitled "The Supervisors Pamphlet."

The topics so far include: The Duties and Responsibilities of the Supervisor, Production Man, Cost Man, Time Study Man, and Inspector; New Employees, Grading Employees, Transportation, Working Force, and Economics. Two years were devoted to the discussion of economics. This year the subject is psychology.

College Graduates Trained

MEN of combined executive and technical ability are required each year for replacement or for expansion. Colleges furnish the technical training but they do not fit the men for immediate jobs in most industries. A period of acclimation is necessary. Time is required to learn the policies and principles upon which the business is run. To fill this need, ten engineering graduates are selected each year and are given one year of training.

The first two months in the shop as regular workmen tends to give them a better understanding of the men in the shop. During this period also a vast complicated production system, a seeming mystery, begins to unfold itself as an organized, systematic and efficient procedure. The loose threads of this pattern are further tied together during the next three months in the planning and scheduling department in scheduling and following orders through the shop to insure meeting delivery dates. Two months are spent in the cost department. During the next three months in time study work they take time studies to determine time values on jobs and apply these values. The last two months in the manufacturing engineering department gives them an idea as to the laying out of manufacturing sections and the routing of work to the proper sections in the shop. By observing and working in these various capacities the students learn the organization and systems in a comprehensive way.

Supplementary to this practical side there are two one hour conferences each week where industrial problems as affecting the plant are discussed.

These young men, being for the most part electrical or mechanical engineers, have studied little industrial management. By following a text on this subject, correlating it with the actual systems, policies and organization of this plant, a firm grasp is quickly obtained on factory work. Each member takes his turn leading the discussion which develops in them an ability to direct meetings. Likewise, they learn the organization better through developing the material themselves. Any points that cannot be settled for lack of information are taken up later after an investigation. Executives come in at appropriate times to explain their organizations. For example, after these students have had two months in cost work, and while this is the topic under discussion, the head of the cost department will meet with the group and talk over this work with them.

At the end of the year these men are placed according to their aptitudes, their desires and the need for men in those departments. A large percentage of these men so trained during the past eight years have fitted into the organization and are filling responsible positions in practically every department in the works.

Station G-A-G-E, *Editor Speaking*

Stanley A. Dennis, Editor and Assistant to the President

Marketing Research

TWICE daily in commuting between his home and his office, the editor passes a deserted and empty factory. The building was erected less than ten years ago. It is of concrete, brick and steel construction. It is located close to an adequate labor supply; it has low cost power always available; it has easy taxes; it has ample shipping facilities by water and by rail; and many other advantages. The building is modern in every way, and around it is ample space for growth of any business housed in the factory. It was built by a concern manufacturing an electrical product. The company moved into its new home with the usual enthusiasm that attends such an occasion. For a while things seemed to go well. Flags waved above the building; employees were contented and happy; windows were kept open, and from within came the sounds of business going ahead at full speed. Little by little the business slowed down. In the darker portion of the working day only a part of the building was seen to be lighted. Papers littered the factory grounds. Activity lessened, until only a few office workers were left. A small sign appeared facing the railroad. It read, "Space Available." And now a large sign reads, "FOR SALE OR RENT."

Why? What happened to this business? Answers to such questions have run something like this: "Somebody blundered in the selling end." "They couldn't sell their product as fast as they could make it." "They didn't know their market." "What advertising they did was all wrong. It didn't reach their market." And so on.

Not once has the editor heard an explanation that touched the production end of the business. Always has the answer had to do with some phase of marketing.

There is not anything very new, perhaps, about this industrial tragedy. It has happened many times in the electrical industry. And for the same reasons. It is likely to happen many more times. Until, yes, until marketing genius catches up with production genius; until the skill that has gone into production is matched by that which is set loose in distribution; until guesswork has been eliminated from marketing as it has very largely from manufacturing processes; until production research has been equalled by marketing research. Research of this kind is steadily gaining headway in the electrical industry. It has its methods and its standards of practice. It is proving its value in scores of instances. And as problems of distribution of electrical products grow more complex, marketing research will continue to render a service of increasing value to electrical manufacturers.

Before You Move Think Thrice

MANUFACTURERS who are tempted to listen to the siren voice of an ambitious city promising all sorts of things, in order to persuade the manufacturer to move his business to it, need watch their step carefully. And cities which are in the habit of luring manufacturers into their boundaries will do well to watch their step also.

A warning along this line has been sounded by E. W. McCullough, manager of the department of manufacture of the Chamber of Commerce of the United States. In pointing out to ambitious cities that industrial expansion is beset with economic pitfalls, Mr. McCullough at a recent conference of industrial managers, spoke as follows:

"Any community," he said, "that either develops the building of industrial plants or induces plants to locate with them and does not give consideration to the factors which will tend to insure success is simply inviting a calamity which will have the double effect of placing loss not only upon the industry but upon the local people who invest or are interested in it.

"Production in many lines of industry has reached its peak, at least until larger markets and better distribution are established. Consequently to build more plants and expand capacity to produce in those lines is little short of folly.

"The relocation of plants today, or the establishment of new ones by successful corporations, is done wholly for economic reasons, and to secure these plants you must be able to prove that you have advantages, perhaps in transportation, material supply, labor or proximity to a profitable market. The last is more important than all the others combined. There is no great exodus of plants moving from one location to another, but there is a normal movement for economic reasons."

An Electrical Machine's Weakest Point

MUCH useful experience in machine construction has been credited to manufacturing conditions during the World War. With respect to the application of insulation to electrical machines during that period, the service from poor materials available has fully justified the best possible practice that can be followed. The essential elements of an electric motor, for instance, are copper, iron and insulation. In this machine the rapid conduction of heat from the interior of the windings to the surface is an important and difficult problem.

Iron and copper are not seriously affected by ordinary temperatures, but even good insulating materials are very poor heat conductors. For instance, heat flows through copper more than 2000 times as rapidly as through insulating tape and through iron at least 400 times as rapidly as through this tape. Air is also a very poor conductor of heat when not in motion, so that air confined in pockets in an electrical machine like a motor helps to bring on troubles that are not to be desired. Insulation besides having these bad features also deteriorates under excessive temperatures and is adversely affected by water, oil and dirt. It is also punished and weakened by mechanical and electrical stresses, and is the frailest of parts in the machine in which it is used and the real limitation to its maximum rating. In view of these facts all the available knowledge on the handling and use of insulating material is none too much for its effective use even at the present time. It represents an element in machine construction in which guesswork comes quickly to the surface and breeds endless trouble to all concerned.

Because of standardized construction of electrical

equipment in which insulation is used, troubles from insulating materials are not to be expected when machines are used under normal operating conditions. In view of the fact that buyers of electrical equipment who furnish it as the motive power for mechanical devices cannot always control the conditions under which their apparatus is operated, it is essential that they be prepared to transmit to makers of electrical apparatus as much information as they have available from their own experience so as to secure the best possible service from electrical machines when such information is known. Also it is essential that those who service these electrical machines and make the necessary repairs be well informed concerning the causes of these repairs so as to apply the proper corrective measures.

For these reasons we have selected as a topic for detailed discussion in ELECTRICAL MANUFACTURING, through a series of articles, the methods that will bring about best results in the use of insulating materials when applied to coils and windings of electrical apparatus. We invite comments from readers on this series of articles, the first of which appears in this issue, so that points of particular interest can be incorporated into articles to follow and the maximum benefit secured from the information presented.

Refrigerator Manufacturers Need Organization

THE effort of the National Electrical Manufacturers' Association, now under way, to organize the manufacturers of electrical refrigerators into a section of Nema seems certainly to deserve the approval and support of the manufacturers of that product. As Colonel Frank E. Smith recently said, "In the mechanical refrigeration field there is a dearth of information as to the results of laboratory tests, as to statistical data on production and sales and service, and thus far there has been no worth-while association of manufacturers that could act as a clearing house for information for the benefit of the membership and for the betterment and stabilization of the industry as a whole." The invitation of Nema to the refrigerator manufacturers to attend a meeting in Detroit on May 9 for the purpose of considering organization possibilities holds promise of providing the facilities for the solution of common problems.

Amending Anti-Trust Laws

BUSINESS everywhere is trying to find some solution of the problems raised by the anti-trust laws. Witness the thoughtful presentation of an electrical manufacturer's point of view and his suggestions in this issue of ELECTRICAL MANUFACTURING in the article by Clarence L. Collens, "How Can We Effect Price Stabilization?", beginning on page 54. And Mr. Collens is only one of many executives in the electrical field who are giving serious thought to the difficulties rising out of the operation of the Sherman Law, the Clayton Act, and other laws.

It has been pointed out in discussions of various proposed changes in the law that, if anything of value is to be accomplished by amendments, they "must be general rather than specific in their application and affirmative rather than negative in character," if the existing laws are to fit present economic facts and tendencies.

In this connection it is worthwhile to listen once more to President Theodore Roosevelt, when he told Congress in his annual message in 1905:

"It has been our misfortune that the only laws on this subject have hitherto been of a negative or prohibitive, rather than of an affirmative, kind and, still more, that they have in part sought to prohibit what could not be effectively prohibited, and have in part confounded what should be allowed and what should not be allowed. It is generally useless to try to prohibit all restraints of competition, whether those restraints be reasonable or unreasonable. Where it is not useless it is generally hurtful. This is an age of combination, and any effort to prevent all combination will not only be useless but, in the end, vicious, because of the contempt for law which failure to enforce the law invariably produces."

Counting the Cost

THE extent to which mystery still cloaks the costs of production, even in this day of industrial enlightenment, is revealed in a bulletin issued by the department of manufacture of the Chamber of Commerce of the United States.

Taking the small-tool industry as an illustration, the department charted the range of manufacturing costs for one tool and for twelve different articles. In the case of the twelve items there was a variation between the highest and lowest cost of more than 100 per cent. The discrepancy was as great in the case of the single tool.

"Without any question whatever," the department concludes, "manufacturing costs could not conceivably vary as much as the figures reported. Evidently the manufacturers were not figuring their costs by uniform methods."

In other words, many manufacturers are obviously fumbling in the dark in the matter of costs, hoping from day to day that when the year's balance sheet is drawn the final figure will be black and not red. "Executives," says the department of manufacture, "are rapidly coming to the conclusion that they have as much to gain and nothing to lose through the study by their accountants of the peculiar problems of cost accounting procedure presented by their industries."

Meeting the Problem of Training Shop Executives

EVERY manufacturing plant must have executives who know the plant production scheme from the ground up, who understand not only their own work, but also that of other departments throughout the plant. A man may know the work in his own department, but if he is not fully aware of the responsibilities of the other sections in the production scheme, both before and after his particular section completes its function, the proper cooperation between departments will not be obtained.

Where is the manufacturer to obtain men who can satisfy these requirements? There is no source of men who, without further training, will fit into the organization. Hence the manufacturer must train them in his own plant. W. M. Emerson tells in this issue how one manufacturer has solved the problem of providing shop supervisors and foremen for many years. The results obtained by these methods or similar ones can be applied in your own plant with just as much success as in this one.

One of the most important features of such courses in any manufacturing plant is the sociability of the employees which is created by the mixing of men in all departments. Rush jobs and routine work will go much more smoothly if the men in all departments are acquainted with each other and each foreman realizes what the other must do in order that the work may be executed properly and the shipping dates kept.

MARKETING SYSTEMS *for* Distributing Electrical Goods

No. 1 of a Series of Three Articles on Distribution

How present systems originated and how they compare in efficiency with the selling methods that are used in other industries

BY JOHN ALLEN MURPHY
Marketing Counsellor

THE editor of ELECTRICAL MANUFACTURING has asked me to compare the methods that are used in distributing electrical goods with the methods that are employed in selling the products of other lines of business. This assignment was given to me only because it happens that my work for the last fifteen years has brought me into intimate touch with the selling procedure employed in practically every industry. Such a comparison should develop information and ideas of definite value to the electrical manufacturer.

The success of a business depends very largely on its sales set-up. The best of products may make very little headway if it is backed by a weak sales organization. On the other hand, an indifferent article may make astonishing progress if it is sold efficiently.

It is not enough for the manufacturer to have salesmen, wholesalers and dealers. He will not accomplish much unless he has the right sort of salesmen, wholesalers and retailers. His distributing agencies must be adapted to his particular product. His sales compensation system must be soundly based, or it will not furnish sufficient incentive for his distributors to do their best. There must be an equitable apportionment of territories. Wholesale distributing points must be properly located. If branch offices are employed, should the managers of these offices be permitted to compete with their own salesmen? A hundred and one other questions of this nature must be decided. And if they are not decided wisely, the sales organization will to that extent be handicapped.

Electrical Marketing Problem Is Complex

THE marketing of any product is a complicated problem. It is particularly complicated in the electrical industry because of its vast ramifications. Electricity has entered almost every human activity. For this reason, electrical products are used, in one way or another, in every industry and are becoming an increasingly important part of every line of trade. It is this fact that adds to the complexity of the problem of marketing electrical merchandise.

Our analysis of the subject will run through three articles. This first article will be largely preliminary. In it will be skeletonized the marketing systems most commonly used in selling electrical goods, and how these systems were originated and how they compare in efficacy with the selling methods being used in other fields.

The second article will describe some typical marketing organizations being employed by the manufacturers of electrical goods. It will detail sales compensation plans being used. It will tell something as to how salesmen are trained, how sales conventions were conducted, how territories are split up, how distributors are selected, etc.

The third and final article in the series will outline the ideal distributing organization for manufacturers of different types in the industry. In it conclusions will be drawn from the facts presented in the first two articles. And most important of all—the direction that the marketing of electrical products is likely to take during the next few years will be pointed out.

In using the term "our analysis" above, I do so with more justification that that with which Colonel Lindbergh used the plural "we." He used "we" to denote himself and his airplane. I use "our" to denote myself and the more than one hundred authorities in every branch of the electrical industry who gave me information for use in this series. So there is a wealth of authority and experience behind that "our."

I am merely acting as a reporter and interpreter. No personal opinion will be advanced. Facts will be presented without bias. No particular system of marketing will be either defended or criticized. The purpose of the article is to tell what is being done in the distributing end of this giant industry, and not to tell what should be done.

The first thing about the electrical industry that strikes the analyst is that electrical goods are being sold in more ways and through a greater variety of trade channels than any other merchandise. This condition is easy to explain. It is due to the fact that electricity has a greater number of applications than any other motive force. As a product in any field is motorized or "electrified," it is likely that the revamped article will be sold through the same trade that sold the old product.

Thus when the vacuum cleaner was first brought out, it was logical for its manufacturers to offer it to the merchants that had been handling carpet sweepers. That is why furniture stores and house furnishings stores began to feature the vacuum cleaner even before it put in its appearance in shops specializing in electrical goods.

When the radio set first came out, it was natural for its producer to try to sell it to the trade that handled the article of the closest kin to radio—the phonograph. Hence, musical goods stores were among the first retail establishments to deal in radio sets.

Many Distribution Channels Are Used

WHEN it was found possible to run coffee grinders by electricity, the producers of these improved mills sold the "electrified" product just as they had been selling its hand-propelled predecessor—direct to the grocer or through grocery supply houses.

When electricity was applied to hand and machine tools, the electrical tool followed the same course to the market that it took before its improvement. Thus we find electric drills being sold direct to the retailer, to the retailer through wholesalers, to manufacturers through mill supply houses and to manufacturers direct. There are probably several other complexities in the marketing of that one article,

but the avenues cited are undoubtedly the principal selling channels. Electric drills are sold that way because that is the way they were sold before they were motorized.

When the electric crane and hoist first came out, it was naturally marketed in the same manner that the old-fashioned hoist and derrick was marketed. That is, through the manufacturer's own salesmen calling direct on users and also through manufacturers' agents.

Another reason for the complications which are found in the selling of electrical goods, is that the manufacturers in this business were recruited from almost every industry. For instance, a maker of high grade cutlery added a line of electrical percolators, chafing dishes and other appliances. The first thing he thought of was to sell his new line where he had been selling his cutlery—through jewelers, hardware stores, etc.

A manufacturer of curling tongs discovered several years ago that there was some demand for the new electric curling iron. He had an appliance manufacturer make up a quantity of these irons for him. As might have been guessed he sold them to the only retail trade he knew—the notion dealer.

Or take the case of a manufacturer of therapeutical appliances. Apparently such a line belonged in drug stores. So there is where he offered it, turning its immediate distribution over to wholesale druggists.

Then supposing you were a manufacturer of farm machinery, and you found electricity being extended into the rural districts. A sudden demand developed for motor-driven machines. Where would you sell these motorized machines? To the implement trade, of course. You would conclude it would be easier to tell your implement dealers something about motors than it would be to teach the implement business to the dealer in electrical goods. Multiply these few instances that have been cited by the hundred and you will have a good explanation of the topsy-turvy, heterogeneous distribution situation that exists today in the electrical industry.

Still another reason for the mixed-up character of the channels through which electric goods are marketed is the fact that the electrical industry is still young. It is already a giant in size, but in years it is an infant in arms, especially when compared with groceries, drugs, hardware, wearing apparel and dry goods.

Now when a manufacturer first hangs out his shingle, he is going to sell his goods in any way that he can. It is an up-hill fight for him to get started at best and he is naturally going to accept markets wherever he finds them. He cannot be too scrupulous about protecting established trade channels. The chances are, anyway, that established distributors in that field will not be any too receptive to his proposition. He must establish a demand for his goods before they are willing to listen to him. For this reason, the new manufacturer is likely to be a precedent breaker. He is the biggest single influence in creating irregular selling channels. After his line becomes established, the new manufacturer gradually abandons his strange methods and adheres more closely to the commonly accepted customs of the trade.

This reasoning as to new manufacturers applies to all fields and not alone to the electrical industry. It hits the electrical business a little more patly, for the simple reason that the industry is young and is expanding with amazing rapidity. Hundreds of new manufacturers are breaking into the electrical field every year. Under the circumstances it is too much to expect the industry to have stabilized its distributing processes at this early date.

Even at that, the methods being used in selling electrical goods rather closely parallel the methods being used in other industries. In all fields the most practical plan of distribution has been found to be from the manufacturer to the wholesaler to the retailer. This direct lane may be complicated somewhat by numerous side-paths such as brokers, manufacturers' agents, cash-and-carry jobbers, wagon jobbers, etc. There may be many kinds of wholesalers, and the retailer may be a bird of many hues, but essentially the three principal factors concerned in distribution are manufacturer, wholesaler and retailer. This is as true in the electrical industry as it is in any other field.

The latest Gage List of Electrical Buyers catalogs the following units in the trade:

Jobbers in electrical supplies	737
Jobbers (non-electrical) in radio supplies	485
Manufacturers' agents	1,035
Retail dealers in electrical supplies (not contractors)	14,094

THE BALANCE SHEET OF DISTRIBUTION

Total electrical products manufactured		**$1,398,058,686**
Products not intended for retail distribution:		
Exports	$72,148,232	
Products absorbed in power plants, transmission lines, substations, mines, industrial power plants, railways, telephone and telegraph industry, automotive industry, radio and wireless, naval equipment, assemblies for manufacture of other products, etc.	849,812,493	921,960,725
Balance for retail distribution of interest to contractor-dealers		**$476,097,961**
Manufacturers:		
Sold by manufacturers direct through central stations, non-electrical jobbers, industrial and commercial consumers, non-electrical retail outlets, and direct retail sales to public	$152,500,000	
Sold by manufacturers direct to contractor-dealers	31,500,000	184,000,000
Balance distributed through jobbers		**$292,000,000**
Electrical Supply Jobbers:		
Total volume of business	$312,000,000	
Deduct business not of interest to contractor-dealers: Automotive business, batteries, auto lamps, mining equipment, electric railway business, etc.	20,000,000	292,000,000
Jobbers' sales through central stations, non-electrical stores, industrials, retail sales and courtesy discounts		111,000,000
Jobbers' sales through contractor-dealers		**181,000,000**
Contractor-Dealers:		
Total volume of purchases	$212,500,000	
Purchased direct from manufacturers	31,500,000	
Total purchased from jobbers		**$181,000,000**

"The Balance Sheet of Distribution," to which reference is made by Mr. Murphy, was contained in the report of the trade policy committee of the Association of Electragists, International, presented at the annual convention at Cedar Point, Ohio, Aug. 25, 1926. It stands today as one of the most valuable reports ever made on electrical channels of distribution

Wiring contractors (not dealers)	8,276
Contractor-dealers	11,327
Central stations	5,615
Manufacturers	4,093
Armature winding shops	1,697
Motor buyers	1,653
Exporters	318

That list gives some idea of the complexity that exists in the distribution of electrical merchandise, but it does not adequately portray the full extent of the complexity. The distribution of these goods is further involved because scarcely any two manufacturers sell their line in exactly the same way. Also manufacturers use one system of selling in one part of the country and an entirely different system in another part. Other companies sell the output of one department in a certain way and the output of other departments through radically different channels.

In this respect, also, electrical manufacturers are following in the footsteps of concerns in other fields. There is no such thing as a simple marketing system in any line. Marketing is always a give-and-take proposition. Hard-and-fast rules can seldom be enforced. Building a sales organization is usually a matter of expediency. A distributing machine must be built that will work, and as a rule it cannot be built according to any preconceived pattern. It has to be put together from day to day to suit exigencies as they arise.

The industrial end of the electrical business is even more involved from the selling standpoint than is the retail and contractor end. There was published in Electrical Record, a little more than a year ago, a balance sheet of the distribution of electrical goods. That analysis showed so clearly the breakdown of the sale of electrical merchandise that we are reproducing it here.

It will be noted in that chart that the sale of electrical goods to the industries was $849,812,493, annually, out of a total of $1,398,058,686 electrical goods manufactured.

These industrial sales are made through every conceivable channel—through electrical wholesalers, through mill supply houses, through the manufacturers' salesmen calling direct on the buyer, through manufacturers' salesmen working out of branch offices, through manufacturers' salesmen doing missionary work for wholesalers, through manufacturers' agents, etc. Imagine any selling system that you will and there will be no trouble finding its counterpart in use in the industrial end of the electrical industry.

But here again the electrical business is not much different from other fields. In nearly every line that is being sold will be discovered a more or less complex marketing plan.

Distribution in all fields is constantly becoming more complex. As far as I can determine the only difference between the electrical industry in this regard and other industries is that those engaged in the electrical business do more worrying about it. Business men in other fields have become adjusted to the condition. All stores, regardless of the name they carry, are becoming general stores.

Distribution is always in a frightful state of flux. Safety razor blades were first sold by hardware stores. Then the sale switched to drug stores and from there to cigar stores. Cigarettes have been sold in numerous places, but in recent months grocery stores seem to be gaining the upper-hand in the distribution of this article. Candy used to be a grocery store item. Drug stores now sell twenty-five times more candy than grocery stores.

But these changes in distribution, bewildering as they may appear to be, are after all not important. Drug stores may put in a line of groceries, but despite this competition the overwhelming proportion of all groceries are sold and will continue to be sold through grocery stores. Grocery stores may stock talcum powder and other beauty goods, but this competition is not even noticed by druggists.

It is the same with electrical goods. Electrical articles may be sold in every nook and cranny of the commercial world, but in the long run the contractor-dealer who is equipped to install, to service, to finance and to sell intelligently, is the fellow who is going to do the bulk of the business in the electrical field.

(*Part 2 in the June issue*)

Market Surveys

(*Continued from page* 58)

tion was responsible in 22 per cent of the cases for authorizing changes in lighting; the treasurer in 8.5 per cent; the general manager in 36 per cent; the purchasing agent in 20 per cent; the superintendent in 10 per cent; miscellaneous, including the plant electrician, in 7 per cent. The company had previously called on purchasing agents and plant engineers without much success. This survey showed that these officials were not great factors in effecting changes in lighting in a plant.

6. The spacing of outlets was ascertained. This is an important thing to the company in selling, because if the outlets for lighting are properly spaced, it may be possible merely to change the equipment to obtain good lighting results. If the units are improperly spaced, alterations and rewiring become necessary.

7. The survey showed that in a large majority of cases the installation was put in either by an electrical jobber or electrical contractor. This was important information because it indicated to the manufacturer the sales channels through which prospects could best be reached.

8. Miscellaneous information was also received, such as: (a) types of lamp used, (b) whether the lighting installations were regularly cleaned, (c) number of empty lighting sockets, and (d) to what extent the plants were using reflectors and how many of them were broken.

And this is how the facts were used:

1. On the basis of facts obtained from this survey a very successful advertising campaign was conducted in trade papers and consumer publications. This advertising consisted principally in showing what had resulted from better lighting in plants, together with simple specifications for improving plant lighting.

2. The survey helped in clarifying the company's selling policy; it enabled the company to inform local dealers and contractors about the best class or prospects in their respective territories and about their lighting requirements.

3. A mail campaign, developed for use of contractor-dealers, in six months' time brought the company something like $300,000 worth of new industrial lighting business. Each of the contractor-dealers was given a "sales bible" largely built up out of the survey, giving the facts and figures and the main points for use in canvassing.

4. Contractor-dealers were instructed time and again to call not on the purchasing agent but on the highest man in the organization they could reach, and place before him the five sales arguments of increased production, decrease in spoilage, prevention of accidents, improvement in discipline, and improvement in hygienic conditions, in the proper order of their importance. The contractor-dealer was advised of probable sales resistances and how they could be ovecome.

Market research has become scientific, and to be scientific it must be conducted by persons who are experienced, competent, and—equally important—utterly and completely unbiased. They should not have any financial interest in the results of the research work, such as in the purchase or sale of advertising space or service.

Business men are coming more and more to recognize that a really scientific approach will do for the marketing problems of today what it did for production problems.

News of the Month

A department containing news of electrical manufacturers and also other news of the industry that may be of importance to them

RCA Starts Subsidiary, RCA Photophone, Inc.

Radio Corporation of America announces the formation of a subsidiary company, RCA Photophone, Inc., financed by the Radio Corporation, General Electric Company and Westinghouse Electric & Manufacturing Company. The photophone, an apparatus for synchronizing motion pictures with voice and music, will be sold to schools, churches, motion picture theatres and other institutions.

The board of directors consists of: chairman, James G. Harbord, Owen D. Young, Gerard Swope, Paul D. Cravath, E. M. Herr, E. W. Harden, Cornelius N. Bliss, James R. Sheffield, and David Sarnoff. The officers of the company are: David Sarnoff, president; Elmer E. Bucher, vice-president in charge of commercial activities; A. N. Goldsmith, vice-president in charge of technical matters; George S. De Sousa, treasurer; Lewis MacConnach, secretary; and Charles J. Ross, controller. A. N. Goldsmith, C. W. Stone and S. M. Kintner have been appointed as a board of consulting engineers.

Radio Subjects Announced for June Nema Meeting

Merchandising, advertising and time-payment financing will be discussed at the annual meeting of the Radio Division of the National Electrical Manufacturers' Association at the Drake Hotel, Chicago, June 5-7. Technical subjects, including wired radio and radio standardization, will also form part of the program, according to Louis B. F. Raycroft, vice-president in charge of the Radio Division.

Boyers Successor to Ward as Vehicle Company Head

Ward Motor Vehicle Company, Mount Vernon, N. Y., has named J. C. Boyers president to succeed Charles A. Ward, resigned. Hugh L. Forman has taken Mr. Boyers' place as vice-president in charge of sales. Mr. Ward is now chairman of the board of Ward Baking Corporation and Ward Baking Company. His new duties have also caused him to resign as a director of The Society for Electrical Development.

Charles A. Ward

Mr. Boyers is a director of the American National Bank of Mount Vernon, the Jefferson Title & Mortgage Company, and a vice-president of the Community Trust Company. Mr. Forman was formerly with Franklin Automobile Company, Syracuse, N. Y.

Kolster Radio Is New Name of Federal-Brandes

Kolster Radio Corporation is the new name of Federal-Brandes, Inc., manufacturer of radio receiving sets, 200 Mt. Pleasant Avenue, Newark, N. J. The company has had a reclassification of stock and an increase in capitalization to 1,000,000 shares of no par common. Application has been made for listing on the New York Stock Exchange. New stock will be exchanged for old on the basis of one share old preferred for five new common, one share class A common for one new common and five shares old class B common for four of the new stock.

George W. Mason Heads Copeland Products

George W. Mason is now president of Copeland Products, Inc., 630 Lycaste Avenue, Detroit, electric refrigeration manufacturer. He succeeded William Robert Wilson, who is now chairman of the board. Mr. Wilson is also president of the Murray Corporation of America, manufacturer of automobile bodies. He has been vice-president and general manager of the Copeland company since 1926, prior to which he was works manager of Chrysler Motor Company.

George W. Mason

The Copeland company has leased the property adjoining its plant, and construction now under way will almost double manufacturing facilities.

General Equipment Merges With Allen Electric

General Equipment Corp., Kalamazoo, Mich., has merged with Allen Electric Manufacturing Company, Detroit. The new firm uses the name of Allen Electric & Equipment Company. The factory and main office remain at Kalamazoo.

The officers are: G. H. Allen, president; H. H. Levene, vice-president and general manager; Homer J. Rowling, in charge of sales.

Standards Committee Adopts Simplified Procedure

Extensive revision of its rules of procedure to speed industrial standardization work on a national basis is announced by the American Engineering Standards Committee. Heretofore each sectional committee has acted under the administrative support and direction of one or more of the interested bodies, as sponsors. A sectional committee may now operate autonomously, reporting directly to the A.E.S.C., or it may act under sponsors as before.

W. J. Serrill

The second change recognizes "proprietary" standards and makes possible their revision within a single organization if it be shown that a standard is acceptable to the groups concerned.

The third change provides for very simple cases. The approval of standards under such cases is based upon the action of a conference, followed by written acceptances of the interested groups.

The different methods are founded on the principle that the basic test to be applied in all cases is the fact of the assent, affirmatively expressed, of the groups having substantial interest in the standard. Such groups have an inherent right to representation on the body dealing with the subject-matter of the standard, but it is not essential that this right be exercised.

The election of William J. Serrill, assistant general manager of the United Gas Improvement Company of Philadelphia, to the chairmanship of the American Engineering Standards Committee, has been announced. He succeeds C. E. Skinner of the Westinghouse Electric and Manufacturing Company. The vice-chairman during the coming year will be Cloyd M. Chapman, engineering specialist, New York City, and representative of the American Society of Mechanical Engineers. For the last three years the national standardization activities of the committee have doubled in volume.

Mercoid Corp. Formed

The Mercoid Corporation has been organized by the Federal Gauge Company, thermostat manufacturer, as its operating unit. The company has also acquired a controlling interest in Arcless Contact Company. Headquarters will be maintained at 564 West Adams Street, Chicago.

C. Wendel Muench & Co. Is Organized

C. W. Muench, for nine years director of sales and advertising of George Richards & Company, manufacturer of HEMCO products, has announced the organization of C. Wendel Muench & Company, 557 West Monroe Street, Chicago, as an advertising agency for electrical manufacturers.

C. W. Muench

Mr. Muench has had many years experience in sales and advertising work. He is well known in all branches of the electrical and hardware industries. He has been a frequent contributor to electrical and hardware trade journals. He is co-author of several marketing and advertising books and winner of the 1925 Northwestern University Kellar merchandising prize.

D. F. Miner Now Manages Westinghouse Section

D. F. Miner is now manager of the Material and Process Engineering Department of the Westinghouse Electric & Manufacturing Company. He was first employed by the company in 1919 as an assistant to the section engineer of the electrical section. Later he served as section engineer of the experimental section of the Material and Process Engineering Department.

In that capacity Mr. Miner built apparatus for producing the most powerful stroke of lighting ever under control.

Mr. Miner is a member of the American Institute of Electrical Engineering.

Tousley Succeeds Canada

Victor Tousley has resigned as chief electrical inspector of the city of Chicago in order to manage the field service of the National Fire Prevention Bureau. He succeeds W. J. Canada, who has gone to the National Electrical Manufacturers' Association.

Lincoln Electric Announces New Division Managers

Lincoln Electric Company, manufacturer of "Linc-Weld" motors and "Stable-Arc" welders, announces these changes in its sales and welder service divisions: D. F. Titus, formerly with the Portland Cement Association, in charge of welder service in the New York district; H. A. Stamper, in charge of consumer motor sales in the New York district; A. H. Kirkpatrick, manager of welder service, Cincinnati district; D. W. Carver, manager of welder service in Cleveland district; H. E. Nelson, formerly with the Willys Overland Company at Toledo, in charge of consumer motor sales in Cincinnati district; P. A. Ludwig, manager of welder service in Philadelphia district; Forrest Kessler, transferred from welding time study department at the factory to welder service division, Cleveland district; J. R. Rothermel, in charge of welder service at Chicago; W. Weaver, manager of consumer motor sales, Chicago.

Hurley Machine Organizes Thor Canadian Company

The Hurley Machine Company, 22nd Street and 54th Avenue, Chicago, has organized the Thor Canadian Company, Ltd., for the manufacture and distribution of Thor products in Canada.

F. H. Chapman is president of the new organization. He has been identified with Thor products in Canada for over 15 years, and is a Canadian by birth. J. F. Terry is vice-president, in charge of Canadian sales. The new plant is located in Toronto. The company's products are clothes washers, ironers and vacuum cleaners.

Langley and Estey Selected for Crosley Positions

The Crosley Radio Corporation announces the appointment of Ralph H. Langley as director of engineering and F. Clifford Estey as assistant to the president. Mr. Langley was formerly associated with the International Wireless Telegraph Company, Marconi Wireless Telegraph Company, and the General Electric Company. Mr. Estey has been identified with the American Radio and Research Corporation, Clapp Eastham Company, and Priess Radio Corporation.

R. H. Langley

F. C. Estey

Refrigerator Standards To Be Drawn Up

Establishment of national specifications for domestic refrigerators to permit their purchase on the basis of quality and performance is to be undertaken shortly by a technical committee representing manufacturers, dealers, purchasers, government departments and all other interests concerned, according to the American Engineering Standards Committee, under whose auspices the work will be conducted.

Standardization activities, for the present, will be devoted chiefly to ice boxes and other refrigerators which contain units operated by electricity or gas. The committee's anouncement points out that 12,000,000 domestic refrigerators, representing an annual cost for ice or its equivalent of $26 to $28 for each refrigerator, are now in use.

"The need for specifications to guide the purchaser may be judged from actual tests of three different refrigerators of about the same size conducted by a manufacturer," the announcement adds. "To maintain the same temperature inside the box, one refrigerator melted 22 pounds of ice per day, another melted 28 pounds per day, and a third, 34 pounds. In other words, the third refrigerator required over 50 per cent more ice than the first to maintain a proper temperature. Yet a buyer, unaware of this, might pay more for the poor refrigerator than for the good one. In another test, it was found that the use of extra insulation representing a cost of $20 resulted in a saving in ice of about $9 per year, the equivalent of an annual dividend of 45 per cent.

"At the present time, no specifications exist to guide the average purchaser in the selection of refrigerators. He must depend upon appearance, which is misleading, or upon the claims of salesmen who themselves often know nothing about the actual performance of the boxes they sell."

Theodore Beran Retires

Theodore Beran, commercial vice-president of the General Electric Company in charge of the New York district, retired from active service on May 1. The position of manager of the New York office is being temporarily filled by H. H. Barnes, Jr., assistant manager of the district.

Timmons Corporation Becomes Part of Philco Plant

Philadelphia Storage Battery Company has announced its purchase of Timmons Radio Products Corporation, Germantown, Pa. The Timmons corporation continues to make the Timmons cone speaker and to build speakers for radio set manufacturers, retaining its identity as a separate division of Philco. It will manufacture a new type of speaker for marketing under the Philco name.

John S. Timmons, president of the Timmons corporation, is the inventor of a transmitter no larger than a quarter, which when sewn inside the throat strap of an aviator's helmet, will enable the occupants of a plane to converse.

C. M. Tichenor Manager of Kellogg Works

C. M. Tichenor

C. M. Tichenor has been named works manager of Kellogg Switchboard & Supply Company, Chicago, manufacturer of radio, telephone equipment and automotive apparatus. He directs the entire production and manufacturing procedure. He has recently been in charge of operation for Pierce-Arrow and Rickenbacker motor companies. Prior to that he was associated with the G. W. Goethals Engineering Company, New York City.

W. S. Marvin Is Appointed Metal Ware Official

W. S. Marvin

Walter S. Marvin, formerly sales manager of Metal Ware Corporation, Two Rivers, Wis., has been made vice-president and general manager. General sales offices have been moved to Two Rivers. The office in Chicago is maintained as a district sales office with P. C. Cloyd in charge as manager of the Chicago district.

Kelvinator Makes Changes in Its Field Staff

Kelvinator Corporation, 14204 Plymouth Road, Detroit, has announced many changes in its field organization. All distributors have been placed under one administrative head and all factory branch operations under another.

The new executive organization lines up as follows: R. F. Callaway, manager of branch operations; C. A. Copp, assistant to the president; J. A. Harlan, sales manager of distributors; H. W. Prior, supervisor of all financial affairs of the organization in European countries; R. E. Smithson and E. A. Fisher, assistants to Mr. Callaway; C. J. Vandoren, assistant to Mr. Harlan; H. F. Lehman, division of service manager; H. D. Wehrley, G. S. Jones, Jr., S. R. Prugh and J. B. Reeves, regional distribution managers; H. H. Wampler, R. H. Graham and P. K. Abry, regional managers of factory branches.

Westinghouse Makes Reding Textile Engineer

Henry Warren Reding has been appointed textile engineer of Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. He is responsible for the application and successful operation of the textile equipment of Westinghouse customers. He was formerly associated with Lockwood, Greene & Company, a consulting engineering firm, specializing in textile mill location and construction.

H. W. Reding

Mr. Reding is a graduate of Kansas University. After graduation he entered the employ of the General Electric Company, Schenectady.

Radworth Corp. Formed

Joseph Wertzheiser, formerly vice-president and factory superintendent of Meteor Electric Corporation, New York City, and Harry E. Radack, formerly New York representative of that company, have formed a partnership and bought out the electrical specialty business of L. Enderle, manufacturer of the Magic line of bell-ringing transformers, conduit fittings and porcelain bushings. The new company, Radworth Manufacturing Corporation, is located at 302 Park Avenue, Brooklyn, N. Y.

Foreign Commerce Handbook Issued by Chamber

The "Foreign Commerce Handbook, 1928-1929," has been issued by the Foreign Commerce Department of the Chamber of Commerce of the United States. This is a new publication that will be issued every two years. It aims to furnish members with a list of the leading sources of import and export information and service in the country.

Deneen and Attwood Made Officers of Ohio Brass

Ohio Brass Company, Surrey Road, Mansfield, Ohio, announces the appointment of Robert J. Deneen and Frederick Attwood as vice-presidents. Mr. Deneen is in charge of sales in the Chicago district, and Mr. Attwood is sales manager of the eastern section with headquarters in New York City.

H. L. Dyson Is Sales Head of Miller Company

H. L. Dyson

H. L. Dyson is now general sales manager of the Miller Company, Meriden, Conn. He has been with the company for 21 years, and until recently was eastern sales manager. He is also secretary.

A. F. Warren has resigned as western sales manager to take a similar position with Monowatt Corporation, a division of the Miller Company.

Expect 25,000 at Radio Show and Convention

Attendance exceeding 25,000, or 10,000 more than last year, is expected at the fourth annual convention and trade show of the Radio Manufacturers Association in Chicago, June 11-15. A radio patent cross-licensing plan has been drawn up by a committee headed by A. J. Carter of Chicago, and in cooperation with C. C. Hanch, special counsel and "father" of the patent cross-licensing plan of the automobile industry. The convention will consider this plan. A new constitution and by-laws will be proposed.

Mayor Thompson will welcome the members on Monday, June 11. C. C. Colby, president, will reply. Speakers will include Earl C. Anthony of Los Angeles, for the National Association of Broadcasters, and Harold J. Wrape, president of the Federated Trades Association, both of which organizations hold their annual convention in Chicago at the same time. The annual R. M. A. banquet will be held Thursday.

The trade show will cover more than 30,000 square feet of floor space in the Stevens Hotel. Last year's exhibits covered only 19,000 square feet. Latest models of radio tubes, receivers, loud speakers, parts, cabinets, accessories, etc., will be on display. Arrangements have beeen made by Major H. H. Frost, chairman of the Trade Show Committee. The exhibits are in the hands of G. Clayton Irwin, Jr., of Hermann & Irwin, managers of the Radio World's Fair in Madison Square Garden, New York City, and the Chicago Radio Show, held at the Coliseum.

Kodel Announces A. J. Kohn Industrial Sales Head

A. J. Kohn, sales and advertising director of the Leich Electric Company since 1912, has been appointed industrial sales director for the Kodel Radio Corporation, 507 E. Pearl Street, Cincinnati, in the marketing of Kuprox, a metallic rectifying element.

A. J. Kohn

Mr. Kohn is 43 years of age and is a graduate of the University of Wisconsin. His first position was with the Stromberg-Carlson Telephone Manufacturing Company.

Industrial Heating Report Published by N. E. L. A.

The Industrial Heating Committee of the National Electric Light Association has issued a serial report on "Industrial Electric Heating Installations" made in 55 industrial plants during 1927-28. This data is given for each installation: Heating operation, product, plant, heating equipment, size, insulation, electrical equipment, control instruments, operating temperature, heating cycle, electric heat replaced what other type, whether electric heat effected a saving in operating costs, where the saving was effected, whether the central station was responsible for the installation, whether the user is satisfied, whether the central station is satisfied, and the source of data.

Lighting Equipment Show Space Is Increased

A floor space of approximately 60,000 square feet will be taken up by the exhibits at the National Lighting Equipment Exhibition at the Hotel Sherman, Chicago, June 11-16. This will exceed last year's space by 15,000 square feet. Nine thousand persons are expected to attend the annual convention and exhibition, 2000 more than registered last year. The exhibition will be open to the public only on the last afternoon and evening. On the other days only those connected with the industry will be admitted.

There will be a competitive educational exhibit of lighting equipment sponsored by the Commonwealth Edison Company of Chicago, the Electric Association of Chicago, a committee of the Edison Illuminating Companies and the Electrical Testing Laboratories. The equipment submitted by the competing manufacturing companies must be capable of being merchandised and sold by light and power companies. Prizes totaling $1,000 will be awarded.

Bureau of Standards Issues Testing Laboratory List

A directory of commercial testing and college research laboratories has been issued by the Bureau of Standards, Department of Commerce. This booklet lists 271 commercial testing laboratories, with 92 branch laboratories or offices, and 186 college laboratories. These laboratories are equipped to test commodities to determine whether they comply with purchase specifications. The Bureau feels that "the existence of a thoroughly classified list of commercial testing laboratories will have a number of beneficial effects in promoting the use of specifications, not the least important of which will be the inducement offered to the large number of purchasers who have hitherto hesitated to buy on specifications."

Welding Replaces Riveting in New Plant

Welded instead of riveted joints are being used by the General Electric Company in the factory building at its new plant at Philadelphia. The welded roof truss was especially designed by the company for such applications. In riveted structures, gusset plates are required to connect the various members at their intersections; in welded construction, members are directly connected to each other. General Electric experience has shown that these two items alone result in a saving of from 12 to 15 per cent in the amount of steel required when trusses are welded instead of riveted.

McArdle Named for President of Chicago Flexible Shaft

M. W. McArdle has been named as president of the Chicago Flexible Shaft Company, 5622 West Roosevelt Road, Chicago. He was formerly first vice-president and general manager. He has been identified with the company for over twenty years.

E. E. Arnold Once More with Westinghouse

E. E. Arnold has again become associated with the Westinghouse Electric and Manufacturing Company after an absence of twenty years. His position is that of mechanical engineer for special assignment.

He resigned from the Westinghouse Machine Company in 1908, after having been connected with it for ten years in an engineering capacity. He worked for one year under the direct supervision of George Westinghouse on the development of a high speed, two and four cycle gas engine.

Mr. Arnold has been connected with the Metal Products Company, Detroit; A. O. Smith Company, Milwaukee; Standard Screw Products Company, Detroit; New Departure Manufacturing Company, Bristol, Conn.

A. L. Broomall, Engineer, Dies from Pneumonia

A. L. Broomall, aged 44 years, manager of the Renewal Parts Engineering Department of the Westinghouse Electric & Manufacturing Company, died at his home, 814 Mifflin Avenue, Wilkinsburg, Pa., on April 10 from pneumonia.

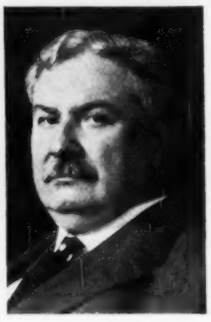
A. L. Broomall

After graduating from Lehigh University, Mr. Broomall went directly to the Westinghouse company and continued to work there until his death. From 1911 to 1915 he had charge of the design of electrical vehicle motors. He then was made section head of direct current motors. In 1922 he was transferred to the renewal parts engineering department.

He was a member of Beta Lodge, F. and A. M., Wilkinsburg, the American Institute of Electrical Engineers, and the American Electric Railway Association.

James J. Wood, Aged 71, Dies of Heart Disease

James J. Wood, consulting engineer of the Fort Wayne Works of the General Electric Company, and one of the pioneers of electric lighting by arc lamps, died April 19, at Asheville, N. C., from heart disease. He had just passed his 71st birthday.



James J. Wood

In 1879 Mr. Wood invented a dynamo so efficient that it caused the Fuller Electric Company to substitute it for the one it was marketing and to change the name of the firm to the Fuller-Wood Company. In 1890 Mr. Wood joined the Fort Wayne company. He invented an arc lighting system, some of the earliest electric fans, and many other devices.

As Mr. Wood came into prominence during the period that electric lighting was commercially established throughout the United States, and as his lighting system was one of the few which survived, he was often grouped with three other contemporary pioneers, Thomas A. Edison, Professor Elihu Thomson and Charles F. Brush. These four men were sometimes referred to by General Electric people as the "big four," because from their work the General Electric Company of today has developed. Mr. Wood was the youngest of the group.

General Electric Earnings Are $48,799,488 in 1927

Earnings of the General Electric Company for 1927 amounted to $48,799,488, equivalent, after dividends on special stock, to $6.41 a share of common stock. In 1926 it was $6.14 a share. There was a 5 per cent decrease in both orders received and orders unfilled in 1927 over 1926. The income from associated companies, miscellaneous securities, U. S. Government securities and royalties is much larger this year than last. The surplus for 1927 amounted to $11,973,267.93.

Williams Holds Sales Schools

Regional sales and service schools held by the Williams Oil-O-Matic Heating Corporation in various parts of the country this year have been having record attendance. In one month twelve meetings attracted an attendance of 904

Heindel and Leonard Join Fada Engineering Staff

H. J. Heindel and A. A. Leonard have joined the engineering staff of the F. A. D. Andrea, Inc., Long Island City, N. Y. Mr. Heindel, formerly research engineer at the Bell Laboratories, who has done work on picture transmission, television and carrier telegraph systems, is now specializing on speaker research and development. Mr. Leonard is now doing production research work, which includes following through with laboratory research the factory products in their various stages from raw material to finished apparatus.

Commerce Department Opens Offices Here and Abroad

Establishment of eight new offices in the trade centers of foreign countries, six new offices in important business localities of the United States and three special regional market surveys covering 21 States, and more specialized attention to the sale abroad of outstanding American export commodities have been made possible through added appropriations, according to Julius Klein, director, Bureau of Foreign and Domestic Commerce.

New foreign offices will be located in Budapest, Hungary; Oslo, Norway; Winnipeg, Canada; Guatemala City, Guatemala; LaPaz, Bolivia; Tientsin, China; Accra, West Africa; and Algiers, Algeria. The new branches will be situated at Denver, Indianapolis, Birmingham, Pittsburgh, Milwaukee and a city in North Carolina.

The surveys will cover the Gulf States, the Central Atlantic States, and Pacific Northwest States. The purpose will be to provide a wide range of economic facts and figures regarding purchasing power, wholesaling territories and other distribution problems.

Benjamin Electric Manufacturing Company, Chicago, has named G. B. Weber manager of refrigerator sales. He was formerly assistant to the president, in charge of sales of the commercial stamping and enameling division.

Cutler-Hammer Manufacturing Company, 12th Street and St. Paul Avenue, Milwaukee, has published a booklet entitled, "Come Adventuring," which describes its product, Thermoplax. This is an insulating material which the company claims will not "crack, warp, burn, discolor or conduct heat readily when subjected to intense temperatures and electrical stress over long periods of time."

Yale Electric Corporation, manufacturer of storage batteries and dry cells, has moved its factory and offices from Tillary and Pearl Streets, Brooklyn, N. Y., to its new building at 257 Cornelison Avenue, Jersey City, N. J.

Sterling Varnish Co., manufacturer of insulating varnish, has moved its plant from Pittsburgh to Haysville, Pa.

Savage Arms Corporation, Utica, N. Y., has promoted A. H. Meyerhoff to manage washer and ironer division sales. He has been with the company for seven years, and for the last three years he has been assistant manager of sales.

Coming Conventions

American Institute of Refrigeration
Annual meeting, May 10-11, Washington, D. C.

American Society of Heating and Ventilating Engineers
Semi-annual meeting, June 26-29, West Baden Springs

American Society of Refrigerating Engineers
June 4-7, Detroit

Artistic Lighting Equipment Association
Annual convention and exhibition, June 11-16, Chicago

Association of Electragists International
Annual convention and exhibition, Aug. 6-11, Chicago

Electrical Manufacturers Club
Oct. 24-27, Westchester-Biltmore Country Club, Rye, N. Y.

National Electrical Credit Association
Annual meeting, July 16-17, Boston, Mass.

National Electric Light Association
Annual convention and exhibition, June 4-8, Atlantic City, N. J.

National Electrical Manufacturers Association
Annual convention, June 11-15, Hot Springs, Va.
Policies Division, July 29-Aug. 1, Association Island, N. Y.

National Fire Protection Association
Annual convention, May 7-10, Atlantic City, N. J.

Radio Manufacturers Association
Annual trade show, June 11-15, Chicago

Haven Manufacturing Company, Milwaukee, has been organized with general and commercial electric refrigerators as its principal product.

F. A. Hinners & Company, 55 West 42nd Street, New York City, has been formed by Frank A. Hinners, formerly president of King-Hinners Radio Company, Buffalo, N. Y. The company is manufacturing and marketing radio loud speakers.

Foldex Electric Heater Company, 1435 Franklin Street, Detroit, has been organized to manufacture electric heaters, cookers and toasters.

Perfection Appliance Company, 2119 Lyman Place, Detroit, announces the addition of A. H. Graham to its sales personnel and Herman Hill to its engineering staff. Mr. Graham was formerly southeastern division campaign manager for Servel Corporation. Mr. Hill was previously a consulting electrical and mechanical engineer. He is also an inventor.

Clements Manufacturing Company, 601 Fulton Street, Chicago, announces the appointment of D. L. Young as general sales manager.

Brandes, Ltd., London, English manufacturer of Kolster radio products, is expanding its factory space and planning to increase its business greatly during 1928.

Ohio Electric Sign Company, 2060 South High Street, Columbus, Ohio, has contracted with the American Neon Light & Sign Corporation, New York City, to install Neon tube signs in Ohio.

The New Departure Manufacturing Company, Bristol, Conn., manufacturer of ball bearings, has announced the making up of new data sheets.

Removals

R. Thomas & Sons Company, manufacturer of lightning arresters, executive offices from East Liverpool, Ohio, to Lisbon, Ohio.

Quadrangle Manufacturing Company, manufacturer of lighting fixtures, from 553 West Monroe Street, to 26-32 South Peoria Street, Chicago.

National-Harris Wire Company, 113 Orchard Street, Newark, N. J., wire mill from 605 North Third Street to Verona and Mt. Prospect Avenues, Newark.

Electric Sprayit Company, manufacturer of hand paint spraying equipment, from Detroit to 320 East Colfax Avenue, South Bend, Ind.

Maas & Waldstein Company, manufacturer of enamels and lacquers, from 45 John Street, New York City, to its factory at 438 Riverside Avenue, Newark, N. J.

Porcelier Manufacturing Company's Pittsburgh office and warehouse to its pottery at East Liverpool, Ohio.

Thomas & Betts Company offices from 63 Vesey Street to 15 Park Place, New York City.

R. Thomas & Sons Company's executive offices from East Liverpool to Lisbon, Ohio.

Trimm Radio Manufacturing Company from 24 South Clinton Street to 847 West Harrison Street, Chicago.

S. Robert Schwartz & Brother, offices and factory from 546 Broadway to 160 Varick Street, New York City, where the company occupies two floors and is equipped to increase production.

Low Tension Electric Company, manufacturer of annunciators, from 35 Ann Street, New York City, to larger quarters at 60 Ann Street.

Carbon Engineering Corporation, manufacturer of carbon brushes, from 1700 Eighth Avenue, Milwaukee, to a new plant at Slinger, Wis., where all departments are under one roof.

Doehler Die Casting Company, executive offices, from its plant at Court and Ninth Streets, Brooklyn, N. Y., to 386 Fourth Avenue, New York City.

Cable Supply Company, Inc., manufacturer of radio tubes, from 31 Union Square, New York City, to 90 North Ninth Street, Brooklyn, N. Y., where it has facilities for doubling production.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Ave., New York City.

"Splendida" Electric Iron.
"Sal. Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Aimco" Factory Horn.
"Arnold" Vapor Bath Cabinets.
"Wharton" Battery Charger.
"Flint" Waffle Iron.
"Packard" Vacuum Cleaner.
"Blaisdell" Automatic Electric Cigar Lighter.

Aluminum--

No. 2 of a Series of Articles on Common Materials

This shows ingots of aluminum being loaded on a hand truck. The metal is originally cast into ingot form. It is sold in this state to companies which have it melted up and cast into the shapes which suit their special needs. Standard ingot forms are plain, notched and waffle

ALUMINUM, a silvery white metal, is obtained commercially by the electrolytic treatment of alumina, prepared chemically or electrolytically from bauxite, a hydrated oxide of alumina, mines of which are found mostly in Georgia, Alabama, Tennessee, Arkansas, as well as in British and Dutch Guiana, and parts of France, Italy, Germany, Hungary and Dalmatia. While alumina is the most abundant of all the earths, being the common constituent of silica minerals, only bauxite running relatively high in alumina content and purity lends itself profitably to the production of aluminum. Both the process of extracting the alumina from the bauxite and that of reducing the alumina to aluminum metal involve heavy power consumption which explains the location of leading plants at points close to hydro-electric power supply, such as on the Saguenay River in Canada.

Aluminum, in the form of hard-drawn wire, has a minimum conductivity of 60 per cent of the international standard for annealed copper, and a specific gravity of 2.705 as compared with 8.890 for copper. For a given resistance aluminum has a weight ratio of one-half that of copper, so that, when conductivity alone is taken into consideration, aluminum is on a parity with copper when its price is twice that of the red metal. While for this very reason the principal tonnage outlet for aluminum in the electrical industry is in the form of conductors for high power transmission, the metal's lightness and attractive appearance, together with its adaptability for precision work, especially in the form of die-castings, have opened the way for use of aluminum parts in innumerable domestic appliances and other products of the electrical industry.

Alloyed Forms for Strength

ALUMINUM can be cast, rolled, forged, drawn into tubes or wire, spun and stamped into different shapes. The tensile strength of aluminum conductors is between 20,000 to 30,000 lb. per square inch. Where high tensile strength is the most important factor, alloys, frequently subjected to special heat treatment, are used. A Swiss producer markets an alloy of high conductivity, especially designed for wire and cable, which contains 98.7 per cent aluminum, 0.5 to 0.6 per cent silicon, 0.4 to 0.5 per cent magnesium and about 0.3 per cent iron. The weight of this alloy is the same as that of pure aluminum, but it has nearly double the strength, and its conductivity is only slightly below that of pure aluminum. It is said to possess a higher resistance to corroding influences than unalloyed aluminum. The high conductivity of this alloy is explained by a particular form of crystallization brought about through special heat treatment. A permanent mold casting alloy, consisting of 88.25 per cent aluminum, 10 per cent copper, 1.25 per cent iron and 0.25 per cent magnesium has a normal tensile strength of 22,000 lb. to the square inch and a Brinell hardness of 80. Under suitable heat treatment the tensile strength is increased to 37,000 and the Brinell hardness to 120.

Has Great Malleability

ALUMINUM ranks next to gold in malleability. It can be rolled into sheets of 0.0007 in. thickness and these beaten into aluminum leaf. Aluminum foil in layers has recently come into vogue for heat insulation in European practice. Aluminum paint, having finely ground aluminum leaf as its base, discloses a relatively recently discovered property of aluminum, that of the minute particles having a tendency to realign themselves as metal leaf after the paint has been applied, or "leafing" as this phenomenon has come to be called.

Aside from its use in high-power transmission and telephone and telegraph lines in the form of wire, cable, busbars, etc., aluminum finds its greatest use in the electrical industry in such domestic appliances as vacuum cleaners, surfacing machines, clothes washers, etc. The frames or main castings of a large number of vacuum cleaners and electric surfacing machines are made of aluminum, usually taking the form of an alloy and quite frequently shaped by die-casting. The satin finish of these castings is the result of lacquer applied with an air spray. In addition to the main casting, many of these appliances contain other aluminum parts. Electric clothes washers frequently have the following aluminum parts: wringer, drain-board, tub, frame. Many washers have an aluminum finish either in whole or in part.

Some electrical refrigerators have aluminum trim on the cabinet. In certain electric air heaters aluminum reflectors are used. Aluminum is used in the frame, fan body, supports, wheel, blades and guards of electric fans and ventilator units. Some types of display window and

How the Industry Uses It

Because of its great malleability, conductivity and lightness, aluminum is a metal of great importance to the electrical industry. It is used both in pure and alloyed forms

By W. C. Hirsch

This man is checking the temperature of an aluminum melting furnace by means of a thermocouple. Exact heating conditions must be adhered to in order to obtain required hardness

showcase reflectors are made of aluminum while others have an aluminum spray finish. Special spotlight attachments are made of aluminum die-castings. Aluminum is used by manufacturers of portable lighting fixtures in the form of tubing and castings, the latter, usually an alloy composition, chiefly for bases. Considerable quantities of aluminum paint are also used in the finishing of popular-priced fixtures.

Aluminum plates are used in several types of radio receiving set condensers, sheets about 1/32 in. thick being the usual material. Soft drawn aluminum sheets are used in head sets. Much aluminum is used for shielding of radio receivers. Aluminum wire is used in antennas, its lightness in weight and resistance to corrosion being especially valuable for that purpose. On a good many radio receiving sets numerous other parts are aluminum die-castings, such as the recess into which the loop is inserted. In wireless telegraphy an aluminum resonator base is used to increase the volume of the sound, some lever sounders being entirely of aluminum, while others have an aluminum key. Aluminum is a sonorous metal and, therefore, suitable for use in phonographs and other apparatus for the reproduction of sound.

In electrical instruments aluminum finds employment not only in frames and housings, but also in the form of foil and wire. Alternating current and certain electrolytic rectifiers have anodes or cathodes made of an aluminum-magnesium alloy. Certain types of electrolytic lightning arresters have aluminum electrodes. Aluminum wire is used in high potential fuses and fused circuit breakers. Electrical cigar lighters have opened another field of aluminum consumption.

Shapes for Marketing

ALUMINUM is marketed in various shapes of ingots. There are notched bars, waffle ingots, and plain ingots, in addition to a number of special shapes. Market quotations are based on purity, the highest grade being 99 per cent plus, while for ordinary foundry work a metallurgical grade running 94 per cent plus is available. Besides virgin metal, remelted aluminum made from scrap is marketed by so-called secondary smelters. In addition to American virgin metal, English, French, Swiss and German aluminum are sold in the New York market.

Rolled aluminum is available in the form of sheets, from 0 to 10 gage, 3 to 30 in. wide. Machine rods and tubes are other standard forms of aluminum. Bare and insulated wire and cable are supplied in sizes from No. 8 B. & S. gage to 2,000,000 circular mils area. Aluminum cable comes concentrically wound, and when composed of more than one layer of strands, each succeeding layer is wound in the opposite direction to that of the layer which it covers. Large sizes are shipped on reels and small sizes in coils. Aluminum bus-bars are frequently shipped in such extraordinary lengths as 300 ft., the coils being straightened out at the point of installation, thereby avoiding unnecessary joints. For connections between extra high potential apparatus and bus-bars, and for the bus-bars themselves, a good deal of aluminum tubing is used. Different types of joints and flat armor and round tie wire are standard commodities. Some aluminum cable is steel reinforced, having a steel core. For this a special type of joint is available. Aluminum leaf is usually sold by the package of 20 books, each book having 500 leaves.

Alloys of aluminum are designated by numbers instead of composition, No. 12 being the most popular and consisting approximately of 92 per cent aluminum and 8 per cent of copper. There are various tempers of sheet aluminum and these tempers are obtained by annealing in gas, oil-fired or electric furnaces for a period of from two hours upward at a temperature of 350 to 500 deg. C. Symbols, of numbers followed by the letter S, are used to designate the various tempers. The symbol for pure hard aluminum is 2 S hard, which means that the sheets must be as hard and pure as it is possible to make them. "Dead soft" sheets are designated 2 S O. 2 S 1 is one gage or number hard; 2 S 2 is two numbers hard, and so on. The higher the number following the S, the harder the temper up to full hard. Tempers are also designated by quarter hard, half hard and three-quarters hard—which means that the sheet has been annealed to acquire relative hardness.

BUILDING SUCCESS by *Efficiency* in Motor Repair

Paul R. Angerman has complete charge of the Weiderman repair shop, his title being superintendent and manager

It is the policy of the George Weiderman Electrical Company, Brooklyn, N. Y., to encourage its employees to advance themselves

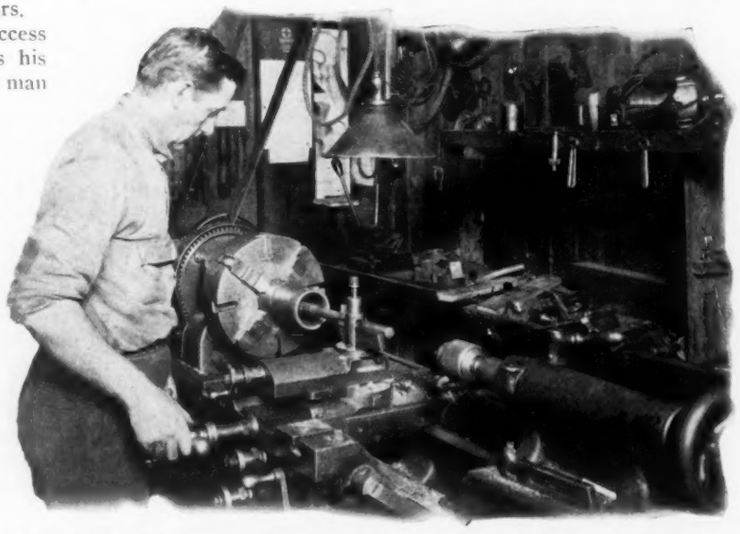
TWENTY-SIX years ago George Weiderman organized a small motor repair shop as part of the general electrical engineering and contracting business which he had already been conducting for ten years. He started the repair department with only one employee in it. His business was then located at 17 New Chambers Street, New York City. Today the George Weiderman Electrical Company, Inc., owns the seven-story building at 35-37 Rose Street, New York City, the fifth floor of which is utilized for its motor repair shop. And there are always from ten to twenty men in the employ of the repair organization. In addition to its repair business the Weiderman company has an electrical store and the offices of its electrical engineering and contracting business at 191 Flatbush Avenue, Brooklyn, N. Y. The Weiderman organization consists of George Weiderman, president and treasurer; George Weiderman, Jr., vice-president; and A. S. Reynolds, secretary. The repair department of the Weiderman company is known as one of the best shops in New York City because of the fine reputation for service that it has built up over a number of years.

A large measure of Mr. Weiderman's success comes from the way he chooses and handles his employees. Under no conditions will he hire a man who has worked at a large number of places and has remained at none of them for any appreciable length of time, nor will he engage a man who says he knows how to do everything. He believes that such men are poor risks. When a man has been "taken on," Mr. Weiderman and other executives of the company give the employee every chance to advance himself. Wherever possible a man in the organization will be promoted to fill a vacancy, rather than to have an outsider hired for that purpose. This is an incentive to the employees to stay with the company. And it is only by keeping a competent and steady group of employees that a repair business can be operated efficiently.

Frequently the Weiderman shop hires boys who are going to continuation school. If these boys appear to be intelligent and willing to learn they are given a chance to step out of the messenger boy class and become shop workers. First, they are allowed to do some wire wrapping. If they show proficiency at this they are given a simple armature winding job. And so, by degrees, they step up until they are expert armature winders, or specialists in some other line of repair shop work. Convincing proof that this is an ideal method for handling young employees is shown by the fact that about 50 per cent of the men now employed in the Weiderman shop have worked themselves up in this manner.

Mr. Weiderman claims that no one should start out in the motor repair business unless he has a large capital. It is not unusual for a repair shop to take five years to build up to the point where it is on a paying basis. At the present time there are a great many motor repair shops, and the competition is very keen. The cost of motors is now so low that the repair work has to be done very cheaply in order to persuade a customer that it is worth his while to have his motor repaired rather than to purchase a new one. In the same way, there are so many second hand motors for sale that this also builds opposition to the repairing feature.

One cannot say to himself, "I am going to start a motor repair shop," and expect to do it as easily as that. The first obstacle to overcome is the building of an organization with which to run your shop. Unless a man is ex-



This machinist is shown boring out a motor bearing which has been rebabbitted. The Weiderman shop prides itself on its careful machine work

and *Service* Shops

By H. L. Holcomb

Associate Editor,
Electrical Manufacturing

John Oderwald, shop foreman, is supervising the lowering of an armature into an electric oven for baking. It will remain in the oven three or four hours at a constant temperature of about 250 degrees Fahrenheit

tremely fortunate it takes several years before he has achieved a satisfactory and permanent personnel.

In starting in the repair business it is extremely difficult to build up a patronage. A very excellent impression may be made by advertising, but no work got, because the persons reached have no trouble at the time. The shop may get some of this business when trouble does come to the prospect's equipment, and again the customer may have completely forgotten about the shop by that time. When a person needs the services of a motor repair shop, he needs them in a hurry because some of his equipment has ceased to operate. He naturally gets hold of the first person he can think of, and nine times out of ten it is someone who has done a good job for him before.

Another reason why repair shops do not pay for themselves at once is because the management must learn by experience how to bill different types of customers. Mr. Weiderman states that it is easier to keep the business of certain concerns if he forces them to pay C.O.D. He finds that small shoe shops which are equipped with motor driven machines fall into this class. These shops are perfectly willing to deal regularly with a motor repair organization as long as it makes them pay at the time the work is done. But as soon as they get their work done first and are billed afterward, trouble begins. They will probably let their bill drag and then will shop around to other motor repair companies the next time they have a breakdown. Thus, you lose not only the cost of the job done for them, but also their future patronage.

A complete record is kept of every motor that comes into the Weiderman shop. A ledger with alphabetical listing of the names of customers is kept for this purpose. The information is entered in the book from the card record of the motor which is kept while the motor is in the shop being repaired. The following information is recorded on the card: make of motor, horsepower or kilowatts, serial number, speed, volts, amperes, phase, cycles, armature number, number of commutator bars, number of coils, turns per coil, size of wire, insulation, pounds of wire on the armature, thickness of mica, pounds of wire and number of turns in the shunt field, pounds of wire and number of turns in the series field, number of poles, interpoles, the coil throw, the pitch of the front lead, and the pitch of the back lead.

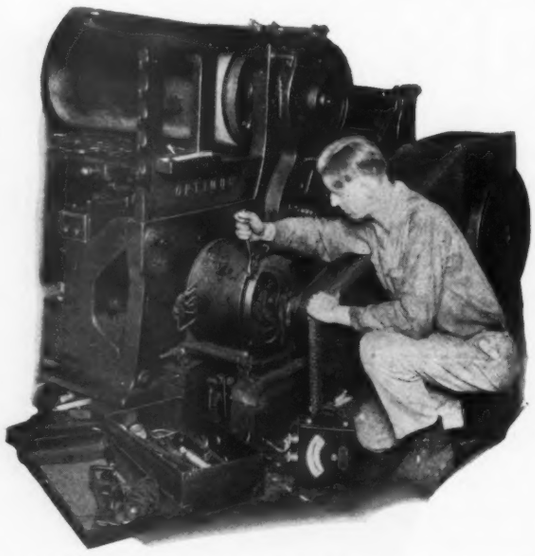
An armature winder is testing a recently wound armature with a millivoltmeter to see if there are any short or open circuits

On the back of the same card a record is kept of the material used in repairing the motor. The following headings for these are given: empire cloth, empire duck, amco paper, fish paper, cotton tape, empire tape, friction tape, solder, paint, shellac, mica, No. 1 micanite, No. 2 micanite, wire, bearings, band wire, fiber, cord, and sleeving. Such a record as this is invaluable in estimating the exact cost of work done on the motor. And back records over a period of time will give an accurate history of both the motor and the material put into it. Thus this repair shop is in a better position to service a motor it has handled previously than is some company which has never seen it. This makes for good customer-relations and the efficient handling of motors in the shop.

When a motor arrives in the Wiederman shop to be repaired, it is put through a definite routine. First it is taken apart, and, while this is being done, the bearings are tested out to see if they are worn. If the bearings are not true, they are turned over to the machinist, who gets new ones out of stock if they are of standard size or makes new ones if they are not standard. The commutator is carefully examined to see whether any short circuits can be found between the bars. If none can be seen, the armature and commutator are tested out with a millivoltmeter. The test is made between each two adjacent bars of the commutator. In the case of any open circuit there will be a

high deflection of the meter. A low deflection would indicate a short circuit. Provided no trouble can be detected by this test, the armature is put on the buck tester. The buck tester is merely a coil attached to a source of A.C. through a controller. The buck tester coil acts as the primary coil of a transformer while the armature to be tested acts as the secondary. The current is turned on, and, if there is a "short" in the armature which so far has gone undetected, the armature will heat up and smoke.

If the coil is burnt out, it is turned over to the coil winder, who makes a note of the information concerning the coil, which is put down on the record card previously mentioned. The coil is then stripped and one new coil is made up like it by the coil winder. This sample is examined by the armature winder to see whether or not it meets the requirements of the armature. If he is satisfied with it, he returns it to the coil winder, who makes up a set of coils like it. These are dipped in varnish, baked, taped and then turned over to the armature winder, who winds the machine. When the armature is finished, it is baked in the oven for three or four hours, then taken out and dipped in insulating varnish. After being allowed to drip, it is placed in the electric oven again, this time for five or six hours. It is then cooled, and tested on both the millivoltmeter and buck tester as above. Following this it is put into the lathe, by the machinist, to be turned off and have the shafts polished. It is again tested as before. The finished parts are now assembled. The motor is then run and given a brake horsepower test. If it meets the requirements set up for it, it is marked "Ok." and shipped out.



This shows a "trouble shooter" out on the job. He is about to dismantle a printing press motor in order to send it to the shop for rewinding

Not all of the work of the Weiderman repair organization is shop work. From 40 to 50 per cent of it entails the sending of men trained in "trouble shooting" out to the motor installations of customers. This requires trouble men to be of the highest type of workmen, as they have to work on their own initiative in locating the trouble. Mr. Weiderman generally has at least six men who do nothing but "trouble shooting." In addition to this, all the armature winders are trained in trouble work so that they can go out on such a job if the emergency arises. It is the policy of the Weiderman company to have the same trouble man take care of the same customer as much as possible. This gives the business the personal touch, as a customer comes to know the man who services his motors. This practice tends to make for satisfaction and is a big factor in keeping a customer's business.

All steady customers are provided with a list of the names and telephone numbers of all the Weiderman trouble men and their foreman. If an emergency arises at night, the customer company can call one of the trouble men direct at his home, and he in turn is authorized to go out and make the necessary repairs. This gives the customer a service which eliminates all red tape and makes for the quickest possible repairs. This policy is part of the Weiderman business because Mr. Weiderman believes that the repair business must be like a doctor in this respect—on call at any moment of the day or night. If repairs are necessary, they are generally urgent and must be performed at once in order to keep other important machinery in operation. The importance of such service as Mr. Weiderman renders cannot be too thoroughly stressed.

When a trouble man goes out on a job, he carries with him a tool bag containing the following articles: A pair of test lamps and their leads; two or three different size screw drivers; pliers, diagonal and standard; hammer; set of S wrenches; monkey wrench; Stillson wrench; friction tape; assortment of nuts, bolts, screws and washers; assortment of fuses; two cold chisels; piece of fiber; piece of mica; hack saw, with an attortment of blades specially ground to remove short circuits on commutators; piece of wire, rubber covered, No. 14; sand paper; carbon brushes of different sizes; two-foot rule; extension cord; tin snips; inside and outside calipers; two small files, and one undercutting file.

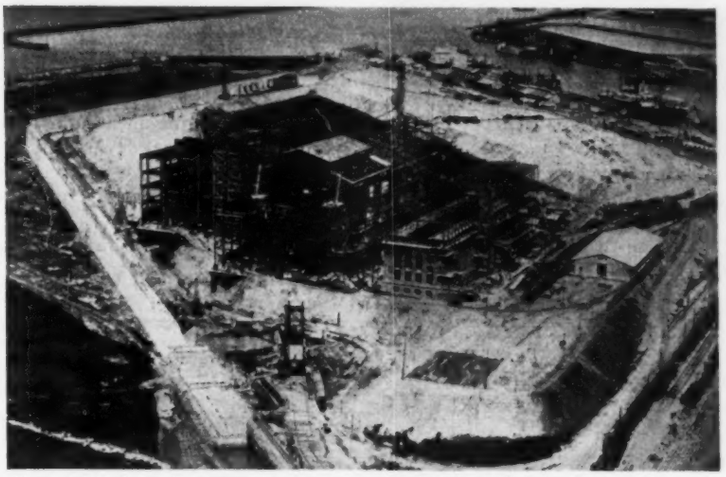
The Weiderman electrical store and contracting business act as opening wedges to obtain some of the repair shop work. This is a great advantage, but cannot be counted on to keep the shop busy. Most of the repair work comes from companies which have long had their servicing done by the Weiderman shop. These customers consist mostly of industrial plants with electrical equipment. A very few are isolated plants. In one respect Mr. Weiderman's contracting business acts as a slight drawback to getting repair work. Rival contractors much prefer to send their work to shops which are in no way connected with a contracting business.

The armature from a recently dismantled motor is being tried out on a small buck tester. If the blade being held by the workman vibrates, there is a short circuit in the armature

Fifty Million Dollars a Year!

The Latin-American market for electrical goods from the United States has already reached that volume, but why not boost it even higher?

ONE of Uncle Sam's house organs, "Commercial Reports," shows that Latin America last year bought $50,000,000 of electrical goods from the United States. Latin America buys monthly as great a quantity of electrical machinery and supplies, from the United States, as do all of Europe, Asia, Africa and Oceania together. How many electrical manufacturers display native keenness of vision in recognizing the value of the trade next door to the South? Why not take full advantage of that opportunity?



The C. H. A. D. E. steam power station in Buenos Aires is the largest in the world and will develop 900,000 hp. The building of this station indicates South America's faith in its own electrical development

Buenos Aires has 2,250,000 people—cultured, affluent, leaders in commercial activity throughout the world. Rio de Janeiro's 2,500,000 people are equally cultured and influential. Latin America has its counterparts, in size, of 32 large American cities, besides 40 other cities of from 50,000 to 100,000 population, and 145 cities of from 20,500 to 50,000 population. All these places are growing rapidly in electrical development.

Brazil is 25,000 square miles larger than the whole of the United States, including Alaska. The Argentine is one-third the size of the United States. The Putu Mayo River in Colombia is navigable for steamers drawing six feet of water for 800 miles in favorable season. How many electrical manufacturers realize the full significance of such facts, of which there are thousands equally as interesting?

Several hundred miles up the navigable part of one of the great rivers of Venezuela there are impassable rapids which cover many miles before the river again becomes navigable for several hundred miles more. Who knows that for years the Venezuelans have been considering building an electrically-operated freight line around these rapids so that a continuous passage of freight can be carried the length of this great artery?

A Wide Range of Opportunity

SOME few of our largest electrical manufacturers are acquainted with such facts, and in many cases are developing them in their own interests; but the great majority of electrical manufacturers of the United States are still unaware of the huge advantages that await them all along the line in Latin America, from the development of the greatest of hydro-electric projects down to the selling of the simplest electrical novelty through thousands of importing electric distributors.

To one who has traveled frequently among the electrical manufacturers of the United States, it has not been a difficult matter to diagnose their attitude of mind with regard to spreading their influence over and into that great Southern continent where 120,000,000 people have to eat and sleep and live generally like all other human beings who dwell in the midst of twentieth century progress.

The electrical manufacturer who knows in his heart that in overlooking Latin America he is neglecting a great opportunity, daily feels regretful that he is postponing action; but he tries to console himself with the erroneous thought that, after all, he would have to build special machinery or dies, or install most expensive and troublesome adjustments to machinery already operating, in order to turn out products to suit the varied and odd requirements of this foreign buyer. He says, with an impatient gesture, "Oh, such a business! What's the use?"

Facts That Should Be Considered

HERE'S the answer to that: let him stop reading foreign propaganda which is sent to our American press with the design to discourage and hinder, or at least to postpone so long as possible, closer commercial relationships among the republics of the Western Hemisphere. Let him consider the $50,000,000 in assorted electrical products that Latin America bought in twelve months, according to the most recent Government report. All of these goods, with possibly little or no special design, are exactly the products that are in daily use in the United States.

Let him consider, for a moment, that since it is generally recognized throughout the world that the greatest electrical progress has its inception in the United States, and that the electrical products of greatest merit emanate from the electrical factories of the United States, it should be easy to deduct that our neighbor to the South, standing in his open door and watching us, would be willing—to say the least—to accept those products that have reached the ultimate of efficiency, safety and economy in our own markets.

Why should he ask for something different? He doesn't. What he does ask is that the electrical manufacturers of the United States no longer "hide their light under a bushel," but let their light shine in Latin America.

Some day electrical manufacturers will analyze the physical and mental factors governing the marvelous potential and immense actual commercial enterprise at their very doors. Then they will be in line to take full advantage of the opportunity that awaits them.

Electrical Manufacturers in a Single Year More Than Double the

Volume of Refrigeration Exports

Government report shows that the rate of increase of export sales in electrical refrigeration equipment is greater than of domestic sales

SALES of domestic electric refrigerators have shown a large increase in the domestic market, but figured on a percentage basis the rate of increase has not been so great as in export sales. It has been estimated that 248,000 domestic electric refrigerator units with a value of $65,200,000 were sold in 1926, and 365,000 units valued at $82,125,000 in 1927. In the accompanying table it is shown that the exports amounted to $1,443,732 in 1926 and $3,684,981 in 1927.

That the demand for small refrigerating equipment changes with seasonal temperature variations is clearly shown by the export figures issued in *Commerce Reports* by the Department of Commerce. In our exports to semi-tropical countries the figures are highest for the months of September, October, November and December. To tropical countries the exports are greatest in August, November and December. The greatest demand in the south temperate zone is from August to December. On the contrary, the north temperate zone export demand is at peak in May and June and is substantial in April and July.

U. S. Refrigerating Equipment Exports

Country of Destination	Refrigerators			Refrigeration Sets Up to 1-ton Capacity, 1927
	1924	1925	1926	
Total to world markets	$370,596	$536,297	$1,443,732	$3,684,981
Belgium	.....	925	6,189	95,542
Denmark	218	720	523	91,242
Germany	.....	.....	8,962	178,761
Italy	366	2,117	23,433	135,285
Spain	313	58	7,903	82,774
United Kingdom	16,638	38,398	222,167	419,368
Canada	11,188	41,834	289,455	334,986
Cuba	196,267	219,286	201,855	34,067
Mexico	34,283	34,238	54,015	80,090
Argentina	7,987	23,244	73,056	186,479
Brazil	2,779	4,168	58,336	236,733
Colombia	2,807	10,893	12,421	20,249
Uruguay	1,591	7,423	26,037	67,346
British India	2,260	2,233	6,881	125,845
Philippines	807	3,671	22,953	115,260
Australia	4,807	28,829	169,286	587,437
British South Africa	19,658	19,428	34,020	185,827

Use of the electric refrigerator is so much more general in the north temperate zone than elsewhere that the world total demand is fairly uniform throughout the year, with the exception of the months of January and February, when there is less call for the units than at any other time. There is a slight falling off in sales in October. About 45 per cent of the world total exports go to the north temperate zone. The United Kingdom leads this group in demand. The 1927 exports of sets up to 1-ton capacity to the United Kingdom amounted to $419,368 and to the north temperate group, $1,682,408.

The use of ice in Europe, although widespread, is not known to the same extent as in the United States. In some countries the climate does not require an extensive use of ice. The continental custom of purchasing supplies of perishable foodstuffs in quantities sufficient for the day only renders the use of ice, to some extent, unnecessary. In the United Kingdom the use of ice is increasing and there is a well sustained market for the preservation of foodstuffs, although the extremes of heat at any time during the year are unusual, and the necessity for refrigeration is not nearly so great as it is in the United States.

Demand for electric refrigeration equipment in Canada, for use in hotels, apartment houses, stores and private homes, is increasing. Cheap power is available throughout a large part of the Dominion, making it one of the best markets for electrical devices. The people in Canada maintain the same standards of living as in the United States, and extensive use of ice and refrigeration is known throughout the country.

It has been estimated that in Germany not one family in ten is provided with an ice box. However, the use of refrigerators is increasing slowly, and many households, food shops and other such establishments are aware of the advantages of a simple and scientific system of refrigeration. But under present conditions, the small average German income does not provide a surplus sufficient to warrant the purchase of costly apparatus. In Norway and Sweden the climatic conditions are such that the demand for ice is not imperative, even during the summer months. However, a great many of the people who live in the cities are beginning to use small ice boxes. American manufacturers will meet considerable competition in these countries from the Swedish Electrolux products.

A large part of Italy lies in a region where fairly warm weather during the summer makes necessary the use of artificial ice as a means of obtaining refrigeration. Many people do not use ice at all, however, depending on the ice boxes of the butcher shops and dairies. In some centers, as in Naples, the retail price of ice is high, about $1.35 per hundred pounds, a factor which contributes to an increase in the use of electric refrigeration in stores and private homes.

United States exports to the south temperate zone in 1927 amounted to $911,209, of which $587,437 went to Australia. Ice in Australia is not so widespread as in the United States, although the people are more accustomed to it than they are in Great Britain. A good market for electric refrigeration equipment has existed in Australia for some time, American products meeting with particular favor. In New Zealand only a few persons have refrigerators. The same is true of Argentina. But, in both places, the market is developing.

Exports to the semi-tropical zone amounted to $426,901 in 1927. The tropical zone demand was $664,463. The most promising markets in these sections are the coast towns of Mexico, Dominican Republic, Guatemala, Cuba, Haitian Republic, Brazil, Ecuador and Colombia.

WHY We Sell Oil Burners *Only* Through Branches

By Haldeman Finnie
General Manager,
The Timken-Detroit Company

Necessity for prompt servicing is a leading reason why this manufacturer uses this method of marketing

DURING our fairly comprehensive investigation of the oil burner field, one of the most notable things we discovered was the small number of dealers who were satisfied with their profits. We felt that no industry, particularly a new one, could be permanently successful unless everyone connected with it, as manufacturer, wholesaler or retailer, was able to make consistently satisfactory profits.

This does not mean, of course, that every concern will be successful, because there will always be failures in any line of business, due to lack of ability or capital, or other reasons which cannot be blamed on the industry itself. But it should be possible for the average man with average ability to make a profit, and I do not think that such a condition exists among oil burner dealers today. Until it does exist, this new industry is not, in our opinion, being built upon a permanent foundation.

Having been identified with the automotive industry since its inception, the officials of our company have vivid memories of the evolution of that industry. About fifteen years ago there were nearly 300 automobile manufacturers; today there are only about 50, and the bulk of the business is concentrated among a very few. The story of the motor truck industry is the same. Many companies foundered on the same rock. They were building cars or trucks just as good, from a mechanical standpoint, as those of their competitors; their engineering and manufacturing departments were just as efficient—but they did not build up sound, substantial, profitable dealer organizations. When the days of comparatively easy selling of a new product were past and the period of intense competition arrived in the automotive field, as it must come to every new industry, it was the old story of the survival of the fittest. Among the fittest were included those far-sighted manufacturers who never forgot that a chain is only as strong as its weakest link, and that a manufacturer can continue to prosper only as long as his retailers prosper.

¶ It is necessary for the manufacturer to adopt methods by which he insures himself against the errors often committed in other new lines

We joined the ranks of oil burner manufacturers with the belief that this industry would have to go through the same evolution as the motor car industry. We felt the necessity of carefully guarding against the errors which we had seen so often committed in that line of business.

One of the first facts we recognized was the fundamental difference between an oil burner and the usual type of merchandise. Since the early days of the human race, when exchange of commodities was effected by barter or exchange, there has been evolved a well defined system of distribution of manufactured goods to meet the needs of our complex modern civilization. There are minor variations in different industries and with different companies in the same industry, but in general the chain of distribution is always the same.

The manufacturer sells to a wholesaler or jobber, who distributes to a retailer, and the product eventually reaches the consumer over the retailer's counter. So well have these channels been developed that one can buy exactly the same articles, usually at exactly the same prices, from one end of the country to the other, at the general store in a tiny crossroads village or at the large establishments in our metropolitan centers.

¶ In delivery to the user and in subsequent servicing the oil burner is fundamentally different from the usual types of merchandise

There are two important differences between the usual type of merchandise and the oil burner: first, delivery to the user; second, subsequent service.

Delivery cannot be made at the retailer's place of business, nor even on the customer's back porch. We must go into his house and install our equipment in his existing heating plant, making of the whole a coordinated system of automatic heat. This is an engineering job, a highly specialized one, because no two houses and heating plants are exactly alike. Each presents a new problem and, if satisfaction is to be insured, each must be handled by a thoroughly competent and thoroughly trained personnel.

Development of a personnel with proper qualifications is not an easy task. Manufacturers know what it means to build up a factory organization of thoroughly competent shop mechanics. When you start a new factory or a new department, it takes time, patience and considerable labor turnover before you get a capable organization together.

If this is a difficult job in a factory, how much more difficult it is to build up an organization of oil burner installation and service men. In a factory you have a group of skilled or semi-skilled mechanics working under one roof and with superintendents, foremen and sub-foremen. But the members of an oil burner installation and service organization must not only learn an entirely new and highly specialized trade, but also be sent out to practice that trade on hundreds of different installations, no two exactly alike, and without the benefit of constant supervision during their apprenticeship.

Oil burner service after installation is more serious with us than service on any other product that comes to mind; not because the oil burner is more complicated or more unreliable than any other type of automatic machine, but because it is the only one whose uninterrupted

operations is so essential to health and home comfort.

When a dealer is called upon for electric refrigeration service, he can tell his customer that his service man is busy but will call later. The customer might be slightly irritated at a twelve or twenty-four-hour delay, but he suffers nothing more than slight inconvenience, and at worst the possible spoilage of a few dollars worth of food. How different it is with an oil burner. In extreme weather, lack of heat for an hour or two is likely to produce serious consequences, particularly if there is illness in the house. Service *must* be given promptly, no matter what the hour or day. With the exception of certain industrial processes which depend upon continuous operation, and which these industries protect by means of permanent maintenance crews and duplicate emergency equipment, I can think of no business in which prompt service is so absolutely essential.

There is an almost complete ignorance of oil burners on the part of the public. So long as this exists, our customers are going to look to us to make even the slightest adjustments or repairs, a responsibility we must accept.

During the last quarter century, we have bred a race of automobile mechanics, and we have made a good start at breeding a race of radio experts. The same evolution will take place with respect to oil burners. The day will come when the ordinary householder will be just as competent to keep his heating equipment in repair as he is today to put in a new fuse for his electric light. But that day is necessarily some years distant. In the meantime, if our industry is to grow in favor, we must shoulder the responsibility of servicing our equipment ourselves. The question of how we are to be paid for this service, how much of it should be given free and included in our selling price, and how it should be charged for after the guarantee period has expired, is a most important one, but not appropriate for this discussion.

Is it not possible that the usual channels of distribution, developed to handle ordinary merchandise, may be inadequate to handle a highly specialized product like the oil burner?

¶ A great deal of special knowledge is necessary for the successful marketing of the oil burner and for its servicing after it has been sold

Establishments are certainly inadequate which attempt to market oil burners by the same methods used to market fixtures, vacuum sweepers or electric refrigerators. But they can be successful if they will frankly recognize that a great deal of special knowledge is necessary, and if they will diligently set out to acquire that knowledge.

How is the oil burner dealer to acquire this special knowledge? He can learn from the bitter school of his own experience, or he can be taught by his manufacturer. Our company believes the latter method is the only proper one, and that it is the manufacturer's duty to educate his dealers and help them in every way to be successful.

Suppose that when we entered the oil burner field we adopted the conventional method of distribution by appointing dealers. Undoubtedly the law of averages would have worked, and by this time a certain percentage of those dealers would be out of business. If any dealer, after having installed a number of our burners, had closed his doors, we could not have left the owners without service facilities until a new dealer was appointed. Nothing could be so productive of ill-will as that. Hence we would have had to send our own men into that town to take care of service, a burden and an expense that might be very serious if several cities happened to be involved at one and the same time.

It was obviously up to us so to arrange our sales plan that a dealer would have no temptation to quit after having once undertaken the sale of our machine. We could insure that by showing the dealer how to make a profit. How could we impart that essential knowledge to our dealers? We could not, because we did not know ourselves. The only sound basis on which we could build up an oil burner business was to start in to operate our own retail establishments. Through the medium of these factory branches we could learn how a product of this type should be sold, installed and serviced. Once having learned the proper way to perform these three important functions of an oil burner distributor and, above all, how to do so at a satisfactory profit, we could then put our product into the hands of dealers and be prepared to show them how to run their business successfully.

¶ The five disadvantages of the branch marketing method, disadvantages which, however, are outweighed by the advantages of this sales plan

There are five disadvantages in this plan:

1. *Requirements of invested capital.* A considerable investment must be made in showroom and service station equipment. There must always be sufficient working capital to carry on the business, particularly when sales are lowest and expenses highest. This investment would amount to a considerable sum if complete nation-wide distribution were attempted.

2. *Difficulty in securing competent personnel.* This is a difficulty which is encountered in every line of business, but seems to be particularly acute in ours because it is still a new industry, and there is no supply of experienced executives to draw from.

3. *Impossibility of rapid growth.* A branch will be only as successful as its manager, and it is hazardous to open new branches until men who are thoroughly competent to manage them are available.

4. *Inability to market in small cities.* It is obviously impossible for either a dealer or a manufacturer to sell oil burners exclusively in a small town. We recognized this fact from the start, but felt that there was such a tremendous market to be developed in the large cities that these would keep us fully occupied for some years and that the question of distribution in the smaller centers could well be postponed.

5. *Difficulty of economical administration.* No matter how sincere, hard-working and loyal a branch manager may be, and no matter what system may be employed to reward him financially for successful accomplishment, the fact remains that he can never have the same vital interest in the profits of the branch as he would have if his own money were invested in the business. When only a small number of branches are involved, headquarters can keep a careful check on the expenses of each, but when the branches increase in number it becomes impossible for any one individual to watch all the details, and avoidable waste is very likely to result.

In spite of these difficulties, we are still of the opinion that the advantages outweigh the disadvantages and that the branch method of distribution is preferable, at least during the first few years of a new business of this character.

We do not consider, however, that selling exclusively through factory branches is the last word in oil burner distribution. On the contrary, we consider our present branch organizations to be more in the nature of experimental laboratories, in which we are endeavoring to discover the most effective methods of operating the retail sales, installation and service departments of a business of this kind.

COST ACCOUNTING Is Basic in Building Up *Profit*

Adequate cost system provides the means by which economical production methods are made possible

BY H. S. BARTHOLOMEW

Manager, Cost and Production Engineering Department, Cooley & Marvin

IF the cost accounting system is properly adhered to and the manufacturer and his organization are fully informed as to manufacturing costs, the predetermined margin of profit which he would like to attain at the end of the year can be realized. Profit is built on his ability to produce his lines at a cost which is within his budget.
H. S. BARTHOLOMEW

PRESENT day competition and rapidly changing conditions have had a marked effect on modern business. The "rule of thumb" methods which were formerly used can no longer be depended upon to show handsome profits or dividends at the end of the year. In every industry there are those who will tell you about the "good old days" when profits were real profits and no manufacturer need worry about wastes and inefficiencies in his plant. Those were the days when orders flowed into the office; the plant was run full time; the old single entry books showed a good profit; cost systems were either unknown or considered a nuisance; the bank balance was good; the employees fairly well paid whether they produced a day's work or not; the reports showed the salesmen were making a few calls each day; there were fewer business clouds on the horizon and, in general, everything went along in a leisurely and satisfactory way from day to day.

Old General Opinion was operating most businesses and had everything his own way in nearly every line of industry. Orders came easily; old machinery was repaired and used indefinitely; extra and unnecessary men were on the payrolls; large sums of money were spent here and there without investigation or much question; department heads were allowed to purchase what they wanted (no one had ever heard of a budget system then); supervision was somewhat indifferent; management was superficial; but in spite of all this, profits were good and no one was required to apply the intensive study to his problems that successful business requires today.

Conditions as just described will probably never recur. This is an age of sudden and quick changes in industry and business. It is, therefore, necessary for the business executive to have a better control of all phases of his business activities, especially his manufacturing operations. To meet these new conditions, great progress has been made in new and better cost accounting methods. Budgetary control has been developed to a very high stage of effectuality. New principles and methods of production have been created which have shown splendid results.

Over-Production in Fixtures

AS a result of keen competitive conditions, the margin of profit on lighting fixtures has been gradually reduced. A great many manufacturers find it hard to obtain the price that they should for their products. In the face of this condition, each manufacturer has endeavored to greatly increase his volume of business and thereby reduce the overhead expense per fixture; but in order to do this, they have been forced to greatly increase their lines of product and manufacture hundreds of different items where formerly they manufactured only a comparatively few products in large quantities.

There is no question but what the lighting fixture industry, as the result of this condition, suffers from over-production. The fixture manufacturers have thus been forced to invade certain markets and make products which their plants were not properly equipped to make economically. The manufacturer whose business has passed through the varying stages and transition periods just mentioned are now beginning to see that they have overlooked one of the biggest opportunities they had to secure greater profits. Instead of trying to attain a large volume of business through price concessions and through scattering their efforts in marketing many different lines of lighting fixtures which they are not equipped to make, they are beginning to realize that the answer to their problem is to manufacture in their factory the lines of product which they are best equipped to make and to increase profits by reducing the cost of manufacturing.

Foremen Eager to Help

THE manufacturer who endeavors to increase profits through cost reduction in his plant begins to realize how dependent he is upon his superintendent and the foremen of his various manufacturing departments. Recently, in my contact with a large number of organizations engaged in the manufacture of lighting fixtures of all types and kinds, I have been impressed with the fact that the superintendent and foremen are eager for more cost information and that in many plants this is not available. In other words, the executive has endeavored to point out the necessity of manufacturing the product in the most economical way possible, yet he is not in a position to actually supply his foremen or superintendent with any definite facts regarding the cost of producing the various parts and making the various subassemblies and major assemblies necessary in making fixtures.

I know of one manufacturer who hesitated a long time before he decided to install adequate cost and accounting methods in his plant. He really had to be sold the idea by members of his own organization who were up against certain cost production problems which they could not answer, owing to the utter lack of information regarding the cost of producing and machining the various parts, as well as the cost of assembling a wide variety of wall brackets, chandeliers, floor lamps, etc.

One of the first steps after finally persuading this manu-

facturer to install the cost system was to put into operation a time card which would show what each employee was actually producing each day for his daily wage. The executive at first opposed the installation of these time cards on the basis that if an employee recorded his production even on the simplest kind of a form which required very little writing, it would interfere with his daily production.

Time Cards Increase Efficiency

SEVERAL months later, I talked with this same manufacturer regarding the results of the cost system, and he volunteered the information that he believed the production in his factory was increased from 8 to 10 per cent through the installation of time cards which the employees were required to make out each day. Formerly they made no report of their daily production. As soon as the employees realized they were being held responsible for a certain amount of production each day, it greatly stimulated their efforts. If the lighting fixture manufacturer will stop to figure out the ratio that his payroll bears to the total cost of manufacturing, and also what a saving of from 8 to 10 per cent would mean to him in increasing production and lowering costs, he will readily see why he should install adequate labor records in his plant to assist his factory organization in reducing costs.

The manufacturer is daily becoming much more dependent upon the superintendent and foremen of his various manufacturing departments for increasing profits. Recently, in a plant where a cost system was installed, a study of the costs showed that certain parts could be bought on the outside cheaper than they could be manufactured within the plant. When confronted with the cost of making these parts, the factory's foreman in charge of these operations was very much surprised. He was, however, given some authentic costs on lots of parts which had been produced, and he immediately showed his resourcefulness by substantially cutting the cost of manufacturing these parts. One part on which there were six operations was re-designed in such a way that the labor cost of producing it was cut 50 per cent. As this part was common to a great many fixtures which were being manufactured, it had a tremendous effect in reducing the cost of the completed products.

It has been our experience that most any experienced foreman can tell approximately what a part should cost. We have invariably found, however, that owing to a great many delays over which the foreman has no control, these costs have been greatly increased when actually put into work. In other words, orders which are incomplete are very often issued to the foreman. He may be delayed because he does not have proper instructions or is forced to wait for groups of other parts to be delivered to his department before he can assemble them. On account of the work being poorly planned, he has many delays in his department and much idle time, due to the fact that the orders were not properly scheduled in the preceding departments, or else he does not have sufficient amount of material on hand to produce the number of parts for which he received the orders. The result is that a foreman welcomes an adequate production and cost plan which will show up all of these inefficiencies in the planning and scheduling of the work, in the proper purchasing of materials, and other delays which tend to increase the cost of production in his department.

It is only through an adequate cost system that these delays and abnormal costs can be figured in dollars and cents and properly analyzed. This information, when properly studied, means that much of this lost time and high cost of production can be substantially reduced or gradually eliminated. It would seem, therefore, that any manufacturer who expects his organization to produce on the most economical basis possible should first give his organization the proper tools to work with.

One of the greatest and most effective steps in modern cost accounting has been to set up standard costs and to budget departmental overhead expenses.

Through the use of standards, the cost of manufacturing a certain part in a certain department can be predetermined and the actual cost compared with it from day to day. The modern cost system does not aim at historical facts, but if properly devised and installed, it will give a foreman a constant check on the productivity of his department as compared with the standards which have been carefully set up as possible of attainment. It has been our experience that there is nothing that creates a greater incentive for a foreman than to tell him what an article should cost and then let him try to better this mark. It stimulates him to greater efforts, as he takes pride in equaling or bettering the predetermined standards which have been set up for him.

Department Budgets Needed

WE have always believed that the factory superintendent or foreman should be educated in the importance of studying his costs of production and, not only reducing the labor cost, but also keeping down the overhead in his department. Probably the greatest mystery in most any manufacturing plant has been to determine the factory overhead expense by departments. There are very few manufacturers who are absolutely sure what proportion of the factory overhead should be absorbed into the product which passes through certain departments of his factory. We usually find that most manufacturers do not departmentalize their overhead, but use a percentage of burden which has been handed down to them from one generation to another.

Recently I found one manufacturer who had not analyzed his burden by departments for a number of years and who was using a flat rate on all his products. Upon departmentalizing his burden and setting up a budget for each department, he found that his superintendent and foremen were greatly interested in endeavoring to better the budget. The net result was that in overhead expense alone he was able to save between 12 and 15 per cent. This was accomplished mainly through suggestions which he received from the heads of his manufacturing departments after showing them at the end of each month the actual burden accrued compared with the actual burden budget which he had carefully predetermined for each department. These comparisons were analyzed in such a way that the discrepancies could be easily traced to a certain class of expense, such as idle time, waiting for stock, waiting for parts, defective work and similar items.

Any manufacturer who does not have a cost system in these days of keen competition is overlooking a splendid opportunity for increasing his profits. If competition makes it impossible to get the prices he should for his product, the one remaining thing for him to do is to increase his margin of profit by reducing his cost of production. The net result is that the manufacturer must turn to his superintendents and foremen to assist him in cutting down the material wastes, for obtaining a better control of the labor, for increasing production and cutting down the overhead expense.

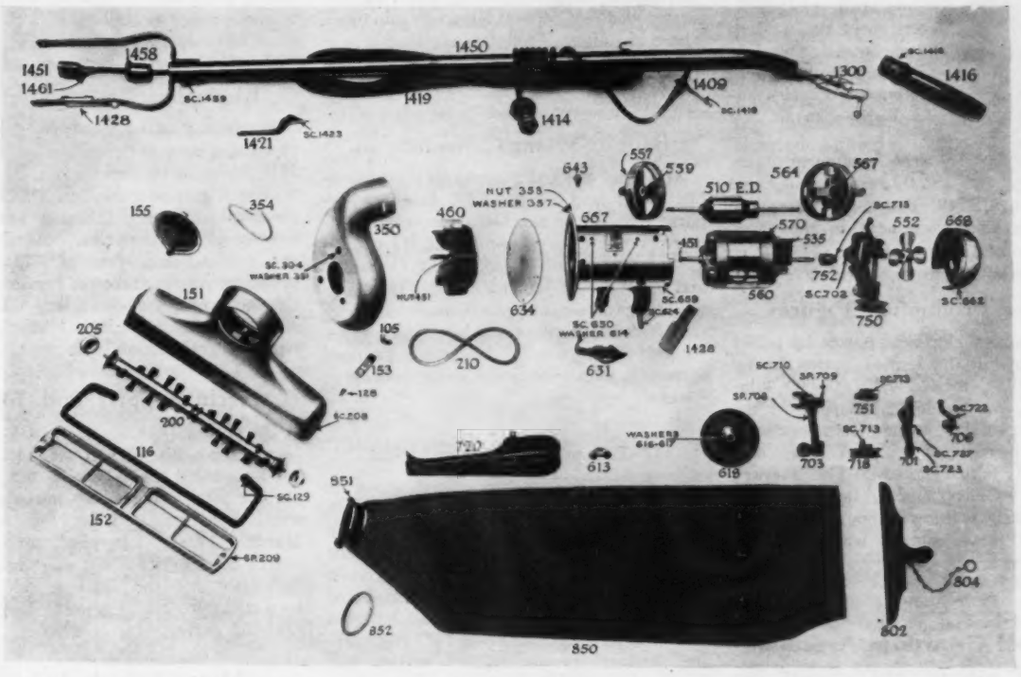
OLD "General Opinion" used to operate most manfacturing plants, and he used a "rule of thumb" method the electrical manufacturer of today cannot afford to follow. Better control of all plant operations is recognized as a necessity in these days. Keen competition for profit margins demand close attention to cost accounting, as the accompanying article by an expert explains.

THE EDITOR

Vacuum Cleaner Components

The figure of 1,038,614 *for the total sales of vacuum cleaners during* 1927 *is that given by the Vacuum Cleaner Manufacturers' Association*

The sale of 1,038,614 vacuum cleaners last year indicates the magnitude of the market for raw materials and parts among the forty manufacturers of this product



ELECTRICAL MANUFACTURING acknowledges the assistance of the M. S. Wright Company of Worcester, Mass., in the preparation of the accompanying illustration and tabular matter

Part No.	Description	Material	Part No.	Description	Material
850	Bag	Cloth	559	Motor bearing (fan end)	
804	Bag chain	Steel	567	Motor bearing (gear end)	
802	Bag clip	Steel	557	Motor housing (fan end)	Aluminum
851	Bag ferrule	Steel	564	Motor housing (gear end)	Aluminum
210	Belt	Rubber	571	Motor carbon brush	Carbon
720	Belt guard	Steel	572	Motor carbon brush spring	
718	Belt pulley	Steel	570	Motor carbon brush cap	
200	Brush	Wood, steel, hog bristles	569	Motor field windings	Copper, cloth
205	Brush bearing	Wood, aluminum	535	Motor plug	
116	Bumper	Leather	667	Motor barrel	Aluminum
552	Cooling fan	Aluminum, brass	668	Motor barrel cap	Aluminum
1419	Cord (24 ft.)	Copper, rubber, cloth fibre	155	Nameplate cap	Aluminum
1421	Cord hook	Steel	150	Nozzle and shoe (151-152 assembled)	Aluminum
1411	Cord spring	Steel	153	Nozzle shoe clamp	Steel
460	Fan	Brass, steel	105	Nozzle shoe clamp wing nut	Steel
350	Fan casing	Aluminum	128	Nozzle shoe clamp spring	Steel
634	Fan spacer	Steel	643	Oiler	Brass
751	Fibre gear	Fibre	852	Gasket (bag)	Rubber, steel
1450	Handle complete	Steel, wood, fibre	354	Gasket (fan case)	Rubber, steel
1416	Handle grip	Wood and rubber	1300	Switch	Steel, fibre, brass, copper
1451	Handle plug (motor connector)	Molded insulation, copper	750	Transmission	Iron, steel
1461	Handle plug spring	Steel	701	Transmission body casting	Iron
1414	Handle plug (attachment)	Molded insulation, copper	703	Transmission pivot casting	Iron
1458	Handle cord protector	Wood	706	Transmission lever casting	Iron
631	Handle stop plate	Steel	618	Wheel	Steel, rubber
1428	Handle stop slide	Steel	613	Wing nut for handle	Steel
560	Motor		752	Worm	Brass

operations is so essential to health and home comfort.

When a dealer is called upon for electric refrigeration service, he can tell his customer that his service man is busy but will call later. The customer might be slightly irritated at a twelve or twenty-four-hour delay, but he suffers nothing more than slight inconvenience, and at worst the possible spoilage of a few dollars worth of food. How different it is with an oil burner. In extreme weather, lack of heat for an hour or two is likely to produce serious consequences, particularly if there is illness in the house. Service *must* be given promptly, no matter what the hour or day. With the exception of certain industrial processes which depend upon continuous operation, and which these industries protect by means of permanent maintenance crews and duplicate emergency equipment, I can think of no business in which prompt service is so absolutely essential.

There is an almost complete ignorance of oil burners on the part of the public. So long as this exists, our customers are going to look to us to make even the slightest adjustments or repairs, a responsibility we must accept.

During the last quarter century, we have bred a race of automobile mechanics, and we have made a good start at breeding a race of radio experts. The same evolution will take place with respect to oil burners. The day will come when the ordinary householder will be just as competent to keep his heating equipment in repair as he is today to put in a new fuse for his electric light. But that day is necessarily some years distant. In the meantime, if our industry is to grow in favor, we must shoulder the responsibility of servicing our equipment ourselves. The question of how we are to be paid for this service, how much of it should be given free and included in our selling price, and how it should be charged for after the guarantee period has expired, is a most important one, but not appropriate for this discussion.

Is it not possible that the usual channels of distribution, developed to handle ordinary merchandise, may be inadequate to handle a highly specialized product like the oil burner?

¶ A great deal of special knowledge is necessary for the successful marketing of the oil burner and for its servicing after it has been sold

Establishments are certainly inadequate which attempt to market oil burners by the same methods used to market fixtures, vacuum sweepers or electric refrigerators. But they can be successful if they will frankly recognize that a great deal of special knowledge is necessary, and if they will diligently set out to acquire that knowledge.

How is the oil burner dealer to acquire this special knowledge? He can learn from the bitter school of his own experience, or he can be taught by his manufacturer. Our company believes the latter method is the only proper one, and that it is the manufacturer's duty to educate his dealers and help them in every way to be successful.

Suppose that when we entered the oil burner field we adopted the conventional method of distribution by appointing dealers. Undoubtedly the law of averages would have worked, and by this time a certain percentage of those dealers would be out of business. If any dealer, after having installed a number of our burners, had closed his doors, we could not have left the owners without service facilities until a new dealer was appointed. Nothing could be so productive of ill-will as that. Hence we would have had to send our own men into that town to take care of service, a burden and an expense that might be very serious if several cities happened to be involved at one and the same time.

It was obviously up to us so to arrange our sales plan that a dealer would have no temptation to quit after having once undertaken the sale of our machine. We could insure that by showing the dealer how to make a profit. How could we impart that essential knowledge to our dealers? We could not, because we did not know ourselves. The only sound basis on which we could build up an oil burner business was to start in to operate our own retail establishments. Through the medium of these factory branches we could learn how a product of this type should be sold, installed and serviced. Once having learned the proper way to perform these three important functions of an oil burner distributor and, above all, how to do so at a satisfactory profit, we could then put our product into the hands of dealers and be prepared to show them how to run their business successfully.

¶ The five disadvantages of the branch marketing method, disadvantages which, however, are outweighed by the advantages of this sales plan

There are five disadvantages in this plan:

1. *Requirements of invested capital.* A considerable investment must be made in showroom and service station equipment. There must always be sufficient working capital to carry on the business, particularly when sales are lowest and expenses highest. This investment would amount to a considerable sum if complete nation-wide distribution were attempted.

2. *Difficulty in securing competent personnel.* This is a difficulty which is encountered in every line of business, but seems to be particularly acute in ours because it is still a new industry, and there is no supply of experienced executives to draw from.

3. *Impossibility of rapid growth.* A branch will be only as successful as its manager, and it is hazardous to open new branches until men who are thoroughly competent to manage them are available.

4. *Inability to market in small cities.* It is obviously impossible for either a dealer or a manufacturer to sell oil burners exclusively in a small town. We recognized this fact from the start, but felt that there was such a tremendous market to be developed in the large cities that these would keep us fully occupied for some years and that the question of distribution in the smaller centers could well be postponed.

5. *Difficulty of economical administration.* No matter how sincere, hard-working and loyal a branch manager may be, and no matter what system may be employed to reward him financially for successful accomplishment, the fact remains that he can never have the same vital interest in the profits of the branch as he would have if his own money were invested in the business. When only a small number of branches are involved, headquarters can keep a careful check on the expenses of each, but when the branches increase in number it becomes impossible for any one individual to watch all the details, and avoidable waste is very likely to result.

In spite of these difficulties, we are still of the opinion that the advantages outweigh the disadvantages and that the branch method of distribution is preferable, at least during the first few years of a new business of this character.

We do not consider, however, that selling exclusively through factory branches is the last word in oil burner distribution. On the contrary, we consider our present branch organizations to be more in the nature of experimental laboratories, in which we are endeavoring to discover the most effective methods of operating the retail sales, installation and service departments of a business of this kind.

COST ACCOUNTING Is Basic in Building Up *Profit*

Adequate cost system provides the means by which economical production methods are made possible

By H. S. BARTHOLOMEW

Manager, Cost and Production Engineering Department, Cooley & Marvin

IF the cost accounting system is properly adhered to and the manufacturer and his organization are fully informed as to manufacturing costs, the predetermined margin of profit which he would like to attain at the end of the year can be realized. Profit is built on his ability to produce his lines at a cost which is within his budget.
H. S. BARTHOLOMEW

PRESENT day competition and rapidly changing conditions have had a marked effect on modern business. The "rule of thumb" methods which were formerly used can no longer be depended upon to show handsome profits or dividends at the end of the year. In every industry there are those who will tell you about the "good old days" when profits were real profits and no manufacturer need worry about wastes and inefficiencies in his plant. Those were the days when orders flowed into the office; the plant was run full time; the old single entry books showed a good profit; cost systems were either unknown or considered a nuisance; the bank balance was good; the employees fairly well paid whether they produced a day's work or not; the reports showed the salesmen were making a few calls each day; there were fewer business clouds on the horizon and, in general, everything went along in a leisurely and satisfactory way from day to day.

Old General Opinion was operating most businesses and had everything his own way in nearly every line of industry. Orders came easily; old machinery was repaired and used indefinitely; extra and unnecessary men were on the payrolls; large sums of money were spent here and there without investigation or much question; department heads were allowed to purchase what they wanted (no one had ever heard of a budget system then); supervision was somewhat indifferent; management was superficial; but in spite of all this, profits were good and no one was required to apply the intensive study to his problems that successful business requires today.

Conditions as just described will probably never recur. This is an age of sudden and quick changes in industry and business. It is, therefore, necessary for the business executive to have a better control of all phases of his business activities, especially his manufacturing operations. To meet these new conditions, great progress has been made in new and better cost accounting methods. Budgetary control has been developed to a very high stage of effectuality. New principles and methods of production have been created which have shown splendid results.

Over-Production in Fixtures

AS a result of keen competitive conditions, the margin of profit on lighting fixtures has been gradually reduced. A great many manufacturers find it hard to obtain the price that they should for their products. In the face of this condition, each manufacturer has endeavored to greatly increase his volume of business and thereby reduce the overhead expense per fixture; but in order to do this, they have been forced to greatly increase their lines of product and manufacture hundreds of different items where formerly they manufactured only a comparatively few products in large quantities.

There is no question but what the lighting fixture industry, as the result of this condition, suffers from over-production. The fixture manufacturers have thus been forced to invade certain markets and make products which their plants were not properly equipped to make economically. The manufacturer whose business has passed through the varying stages and transition periods just mentioned are now beginning to see that they have overlooked one of the biggest opportunities they had to secure greater profits. Instead of trying to attain a large volume of business through price concessions and through scattering their efforts in marketing many different lines of lighting fixtures which they are not equipped to make, they are beginning to realize that the answer to their problem is to manufacture in their factory the lines of product which they are best equipped to make and to increase profits by reducing the cost of manufacturing.

Foremen Eager to Help

THE manufacturer who endeavors to increase profits through cost reduction in his plant begins to realize how dependent he is upon his superintendent and the foremen of his various manufacturing departments. Recently, in my contact with a large number of organizations engaged in the manufacture of lighting fixtures of all types and kinds, I have been impressed with the fact that the superintendent and foremen are eager for more cost information and that in many plants this is not available. In other words, the executive has endeavored to point out the necessity of manufacturing the product in the most economical way possible, yet he is not in a position to actually supply his foremen or superintendent with any definite facts regarding the cost of producing the various parts and making the various subassemblies and major assemblies necessary in making fixtures.

I know of one manufacturer who hesitated a long time before he decided to install adequate cost and accounting methods in his plant. He really had to be sold the idea by members of his own organization who were up against certain cost production problems which they could not answer, owing to the utter lack of information regarding the cost of producing and machining the various parts, as well as the cost of assembling a wide variety of wall brackets, chandeliers, floor lamps, etc.

One of the first steps after finally persuading this manu-

facturer to install the cost system was to put into operation a time card which would show what each employee was actually producing each day for his daily wage. The executive at first opposed the installation of these time cards on the basis that if an employee recorded his production even on the simplest kind of a form which required very little writing, it would interfere with his daily production.

Time Cards Increase Efficiency

SEVERAL months later, I talked with this same manufacturer regarding the results of the cost system, and he volunteered the information that he believed the production in his factory was increased from 8 to 10 per cent through the installation of time cards which the employees were required to make out each day. Formerly they made no report of their daily production. As soon as the employees realized they were being held responsible for a certain amount of production each day, it greatly stimulated their efforts. If the lighting fixture manufacturer will stop to figure out the ratio that his payroll bears to the total cost of manufacturing, and also what a saving of from 8 to 10 per cent would mean to him in increasing production and lowering costs, he will readily see why he should install adequate labor records in his plant to assist his factory organization in reducing costs.

The manufacturer is daily becoming much more dependent upon the superintendent and foremen of his various manufacturing departments for increasing profits. Recently, in a plant where a cost system was installed, a study of the costs showed that certain parts could be bought on the outside cheaper than they could be manufactured within the plant. When confronted with the cost of making these parts, the factory's foreman in charge of these operations was very much surprised. He was, however, given some authentic costs on lots of parts which had been produced, and he immediately showed his resourcefulness by substantially cutting the cost of manufacturing these parts. One part on which there were six operations was re-designed in such a way that the labor cost of producing it was cut 50 per cent. As this part was common to a great many fixtures which were being manufactured, it had a tremendous effect in reducing the cost of the completed products.

It has been our experience that most any experienced foreman can tell approximately what a part should cost. We have invariably found, however, that owing to a great many delays over which the foreman has no control, these costs have been greatly increased when actually put into work. In other words, orders which are incomplete are very often issued to the foreman. He may be delayed because he does not have proper instructions or is forced to wait for groups of other parts to be delivered to his department before he can assemble them. On account of the work being poorly planned, he has many delays in his department and much idle time, due to the fact that the orders were not properly scheduled in the preceding departments, or else he does not have sufficient amount of material on hand to produce the number of parts for which he received the orders. The result is that a foreman welcomes an adequate production and cost plan which will show up all of these inefficiencies in the planning and scheduling of the work, in the proper purchasing of materials, and other delays which tend to increase the cost of production in his department.

It is only through an adequate cost system that these delays and abnormal costs can be figured in dollars and cents and properly analyzed. This information, when properly studied, means that much of this lost time and high cost of production can be substantially reduced or gradually eliminated. It would seem, therefore, that any manufacturer who expects his organization to produce on the most economical basis possible should first give his organization the proper tools to work with.

One of the greatest and most effective steps in modern cost accounting has been to set up standard costs and to budget departmental overhead expenses.

Through the use of standards, the cost of manufacturing a certain part in a certain department can be predetermined and the actual cost compared with it from day to day. The modern cost system does not aim at historical facts, but if properly devised and installed, it will give a foreman a constant check on the productivity of his department as compared with the standards which have been carefully set up as possible of attainment. It has been our experience that there is nothing that creates a greater incentive for a foreman than to tell him what an article should cost and then let him try to better this mark. It stimulates him to greater efforts, as he takes pride in equaling or bettering the predetermined standards which have been set up for him.

Department Budgets Needed

WE have always believed that the factory superintendent or foreman should be educated in the importance of studying his costs of production and, not only reducing the labor cost, but also keeping down the overhead in his department. Probably the greatest mystery in most any manufacturing plant has been to determine the factory overhead expense by departments. There are very few manufacturers who are absolutely sure what proportion of the factory overhead should be absorbed into the product which passes through certain departments of his factory. We usually find that most manufacturers do not departmentalize their overhead, but use a percentage of burden which has been handed down to them from one generation to another.

Recently I found one manufacturer who had not analyzed his burden by departments for a number of years and who was using a flat rate on all his products. Upon departmentalizing his burden and setting up a budget for each department, he found that his superintendent and foremen were greatly interested in endeavoring to better the budget. The net result was that in overhead expense alone he was able to save between 12 and 15 per cent. This was accomplished mainly through suggestions which he received from the heads of his manufacturing departments after showing them at the end of each month the actual burden accrued compared with the actual burden budget which he had carefully predetermined for each department. These comparisons were analyzed in such a way that the discrepancies could be easily traced to a certain class of expense, such as idle time, waiting for stock, waiting for parts, defective work and similar items.

Any manufacturer who does not have a cost system in these days of keen competition is overlooking a splendid opportunity for increasing his profits. If competition makes it impossible to get the prices he should for his product, the one remaining thing for him to do is to increase his margin of profit by reducing his cost of production. The net result is that the manufacturer must turn to his superintendents and foremen to assist him in cutting down the material wastes, for obtaining a better control of the labor, for increasing production and cutting down the overhead expense.

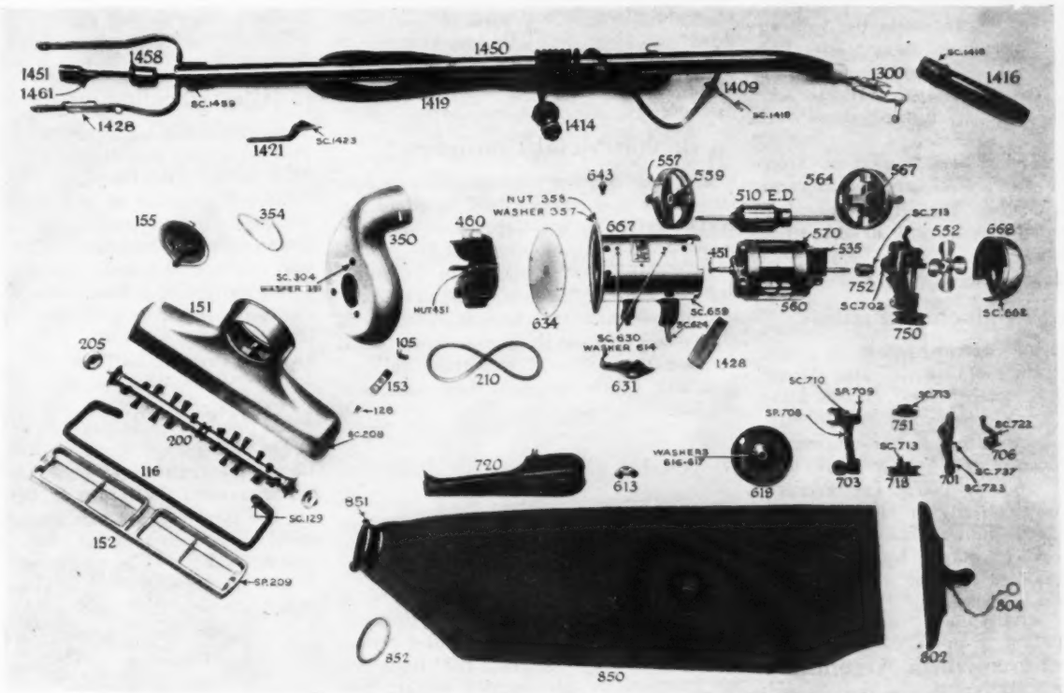
OLD "General Opinion" used to operate most manfacturing plants, and he used a "rule of thumb" method the electrical manufacturer of today cannot afford to follow. Better control of all plant operations is recognized as a necessity in these days. Keen competition for profit margins demand close attention to cost accounting, as the accompanying article by an expert explains.

THE EDITOR

Vacuum Cleaner Components

The figure of 1,038,614 *for the total sales of vacuum cleaners during* 1927 *is that given by the Vacuum Cleaner Manufacturers' Association*

The sale of 1,038,614 vacuum cleaners last year indicates the magnitude of the market for raw materials and parts among the forty manufacturers of this product



ELECTRICAL MANUFACTURING acknowledges the assistance of the M. S. Wright Company of Worcester, Mass., in the preparation of the accompanying illustration and tabular matter

Part No.	Description	Material	Part No.	Description	Material
850	Bag	Cloth	559	Motor bearing (fan end)	
804	Bag chain	Steel	567	Motor bearing (gear end)	
802	Bag clip	Steel	557	Motor housing (fan end)	Aluminum
851	Bag ferrule	Steel	564	Motor housing (gear end)	Aluminum
210	Belt	Rubber	571	Motor carbon brush	Carbon
720	Belt guard	Steel	572	Motor carbon brush spring	
718	Belt pulley	Steel	570	Motor carbon brush cap	
200	Brush	Wood, steel, hog bristles	569	Motor field windings	Copper, cloth
205	Brush bearing	Wood, aluminum	535	Motor plug	
116	Bumper	Leather	667	Motor barrel	Aluminum
552	Cooling fan	Aluminum, brass	668	Motor barrel cap	Aluminum
1419	Cord (24 ft.)	Copper, rubber, cloth fibre	155	Nameplate cap	Aluminum
1421	Cord hook	Steel	150	Nozzle and shoe (151-152 assembled)	Aluminum
1411	Cord spring	Steel	153	Nozzle shoe clamp	Steel
460	Fan	Brass, steel	105	Nozzle shoe clamp wing nut	Steel
350	Fan casing	Aluminum	128	Nozzle shoe clamp spring	Steel
634	Fan spacer	Steel	643	Oiler	Brass
751	Fibre gear	Fibre	852	Gasket (bag)	Rubber, steel
1450	Handle complete	Steel, wood, fibre	354	Gasket (fan case)	Rubber, steel
1416	Handle grip	Wood and rubber	1300	Switch	Steel, fibre, brass, copper
1451	Handle plug (motor connector)	Molded insulation, copper	750	Transmission	Iron, steel
1461	Handle plug spring	Steel	701	Transmission body casting	Iron
1414	Handle plug (attachment)	Molded insulation, copper	703	Transmission pivot casting	Iron
1458	Handle cord protector	Wood	706	Transmission lever casting	Iron
631	Handle stop plate	Steel	618	Wheel	Steel, rubber
1428	Handle stop slide	Steel	613	Wing nut for handle	Steel
560	Motor		752	Worm	Brass

Facts, Figures and Trends

Statistical information of value to electrical manufacturers in working out policies and plans for production and marketing

U. S. Electrical Trade

In January, 1928, the United States exported electrical equipment to the value of $7,981,082 as against imports totaling $97,055. Exports to countries in the western hemisphere were the largest, totaling $4,366,498. Asia, Africa and Oceania were next with exports to those territories aggregating $1,971,662. Europe came last with $1,642,922.

Imports of electrical equipment from Germany totaled $52,217, and Japan came second with $15,749. The United Kingdom and Switzerland were next in the order named.

Power Production Figures

Production of electrical power by public utility plants in the United States during January, 1928, totaled 7,197,000,000 kilowatt-hours, the Geological Survey of the Department of the Interior has announced. This is an increase of 6½ per cent as compared with January, 1927. The average production of electricity in January, 1928, was 232,100,000 kilowatt-hours per day. The water power output was 87,700,000 kilowatt-hours per day, or about 38 per cent of the total output.

Electrical Growth in Argentina

Lack of domestic coal supplies has brought about a more or less general electrification of the industries of Argentina, including sugar refining, meat packing, grain storage and wine manufacturing. A large number of small plants, representing various industries which formerly produced their own power have of late turned to central station service. A greater demand for motors and all kinds of wiring devices has thus been created.

Employment

The expectation that labor will be well employed during 1928 is based on the belief that a heavy volume of production in the largest industries will keep labor occupied. The automobile industry, iron and steel, and the building trades are likely to furnish a large demand. The position of agricultural communities and the prospects of the railroads to enjoy normal business are further regarded as good indications for employment.

Radio Sales

Radio business during 1927 approximated a half-billion dollars, according to a statement by R. A. Klock, chairman of the statistical committee, Radio Division, National Electrical Manufacturers Association. The average radio dealer did a business of $11,000. There was a slight increase in the sale of loud speakers, socket power units and A.C. tubes and sets and a decrease in battery operated receivers, dry cells and direct current types of radio tubes. There are about 8,000,000 receiving sets in use today, of which approximately 1,000,000 are A.C. tube sets.

Babbitt-Metal Consumption

The total apparent consumption of babbitt metal in January, 1928, based on reports received by the Department of Commerce from 31 firms, was 4,928,517 pounds as compared with 4,465,787 in December and 5,439,389 in January, 1927. This consumption is calculated from manufacturers' sales, and consumption by those firms (among them several important railroad systems) which consume their own production.

Our Long Purse in 1928

In discussing America's long purse in 1928, the executive secretary of the Pollak Foundation for Economic Research said in the *Magazine of Wall Street*, "during the past six years we have experienced a greater increase in physical production and in real earnings than in any similar period of industrial progress. Since 1922 the average productivity per factory worker has increased by one-third, and the average income per person has risen above $2,000.

"Our prosperity is due not only to elimination of industrial waste and increase in standards of efficiency and governmental economy, but to the application of capital to new industrial developments. However, precaution must be used in matter of overproduction. Prices will fall if production increases at a faster rate than the supply of money and bank credit. Declines in price levels curtail production, which necessitates laying off men and decreases consumption ability. Today, the margin of under-consumption is widening as industry over-produces relative to demand."

Electric Fan Markets

Electric fan imports by countries in the tropical and semi-tropical zones amounted to about half of the total international fan sales. Exports of fans from this country to world markets amounted to $948,124 in 1926 and jumped to $1,004,811 last year. Present development of tropical markets is much hindered by high costs, unreliability and lack of electric service supply. However, existing power stations are being extended and new stations erected, and with the increased standard of living induced by the presence of a dependable electricity supply service, available at gradually decreasing cost, the demand for fans should increase. Although about one-half of the total international fan sales are concerned with countries in the tropical zones, the value of United States exports to these zones is only about a third of our total fan exports.

Electrification of Factories

Electrification of factories is proceeding at a rapid pace in the United States. Since 1919 the total increase of six and one-half million horsepower in factories has been in electrical motors purchasing power from inter-connected systems. More than 70 per cent of the total of 41,000,000 hp. prime movers in factories is now electrical. On the average, each factory wage earner is aided today by 4.3 hp. This amount is twice as great as in 1910.

March Exports and Imports

The Bureau of Foreign and Domestic Commerce of the Department of Commerce has announced the following figures showing the total exports and imports of electrical apparatus during the month of March, 1928: Electrical exports for March totaled $9,668,279 as compared with $8,668,079 for the same month in 1927. Imports into the United States totaled $243,102 during March, 1928.

Motor Vehicle Industry

In the motor industry the entire group is rapidly increasing employment, speeding up production and pointing to a new record year in its history. A 1928 market for nearly 5,000,000 cars and trucks is indicated by the Standard Statistics Company on the basis of a replacement demand for 3,000,000 cars and trucks and a new car demand of over 1,500,000.

Iron and Steel

Mill operations in this industry have been increasing steadily and, at the beginning of February, averaged about 90 per cent of practical capacity for the U. S. Steel Corporation compared with a low of 60 per cent for last fall. The leading independent companies have increased from 50 to 80 per cent of practical capacity during the same period. Prices on steel products have also increased amounting on an average to approximately $1 per ton or 2.5 per cent.

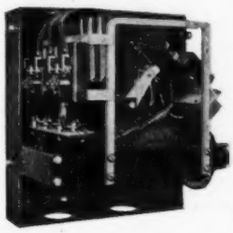
Orders for Electrical Goods

New orders booked for the first quarter of 1928, as reported to the Department of Commerce by 86 manufacturers of electrical goods, were $244,916,615, as compared with $239,999,298 for the last quarter of 1927 and $243,651,415 for the first quarter of 1927.

New Goods—for Your Inspection

A department for the description of new devices, parts, materials and special tools for use in the manufacture and repair of electrical products

Lincoln Automatic Starter



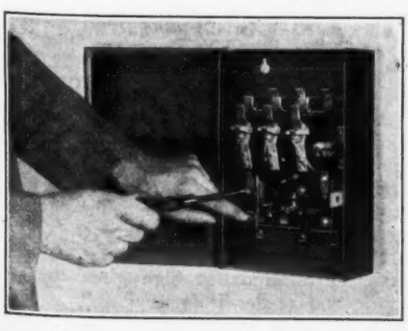
Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio, has placed on the market the Lincoln automatic induction starter for motors on blowers, compressors, textile machines, machine tools, welders, presses and woodworking machines. Two adjustments are possible with this starter. The rotor is index mounted, and by changing its position the starting current and starting torque can be varied. The other adjustment is in the current at which throw-over takes place. The throw-over is controlled by a retarding solenoid, which is operated by the motor current. The pull of the solenoid is adjusted by a simple lock rod on its plunger. The starter is push-button operated.

Switch Plug

Rodale Mfg. Co., 200 Hudson St., New York, has brought out Model No. P-15 switch plug for use on such electrical appliances as toasters, waffle irons, flatirons, etc. The switch mechanism is of the side toggle type, and is designed to be rugged and have long life.

Induction Motor Starter

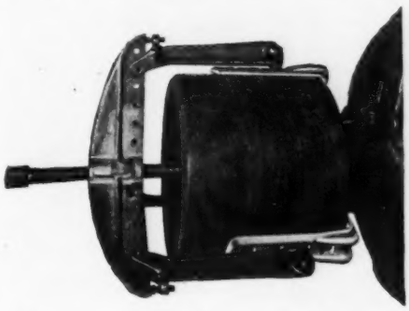
Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., announces a squirrel cage induction motor starter with a maximum rating of 7½ hp. It is particularly suited for the starting and protection of small induction motors driving



machine tools, textile machinery, woodworking machines, pumps, fans and other machines where remote control with complete protection to operator, motor and machine is desired. It is equipped with a hand reset for the thermal overload relay, which is so constructed that the hand reset lever can be easily removed and replaced by an automatic reset. All operating parts are so finished as to prevent corrosion. The copper and brass parts are tinned, while the iron and steel parts are cadmium plated. The inclosing cabinet is dust-proof and is 8½ in. wide, 12½ in. high and 5¾ in. deep. The approximate shipping weight is 15 lb.

Pulley Puller Extension Jaw

Crane Puller Co., Waltham, Mass., has brought out the Crane extension jaw designed for use with the Crane Crow-foot



puller for removing paper-faced pulleys from electric motor shafts. The extension jaws are furnished in sets of three and are available for removing pulleys 5 to 20 in. in diameter and 8 to 26 in. across the face.

Utah Speaker Unit

Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, has added type XM

to its Utah line of speakers. The diaphragm is attached to the armature through a tripod arrangement, which gives great freedom to the movement of the diaphragm and decreases the necessary movement of the armature for any given vibration.

Recto Tube Socket

Recto Mfg. Co., 23 W. Third St., Cincinnati, Ohio, has placed on the market the Recto four-prong radio tube socket, constructed of bakelite. This socket is arranged for mounting on the

under side of a sub-panel or on the surface. The terminals are marked on both sides to facilitate wiring. Phosphor bronze spring clips are used and connections are soldered direct to the clips.

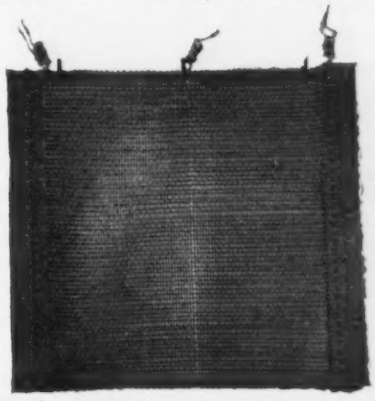
Intermediate Base Sockets

Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., has brought out a line of intermediate base sockets, designed for use with the type S-11, 10-watt lamp in decorative lighting units. Model No. 6421 of this line is a brass shell key socket with a ⅛-in. cap. Model No. 6482 is a keyless socket with brass shell and ⅛-in. cap. Model No. 6090 is a pull-chain socket with ⅛-in. cap. Model

No. 6001 is an adapter for converting the medium base socket to the intermediate where this is desired. Model No. 6215 is a pull-chain candle socket and Model No. 6198 (illustrated) is a keyless candle socket.

Weaco Heater Grid

Warren Electric Appliance Co., Warren, Pa., has brought out the Weaco flexible woven heater grid for use in many electrical appliances. The grids, usually furnished without frames, are available in



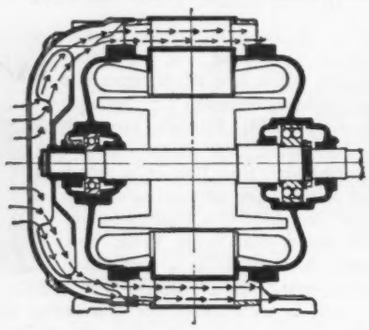
any size, wattage, voltage or for single or three-heat applications. They are designed for use in ovens, toasters, water heaters, air heaters, etc.

S-M Filament Transformer

Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago, has brought out S-M Model No. 247 filament transformer, designed for supplying filament current to A. C. tubes in sets using harness adapters. It contains a 105 to 120 volt, 60 cycle primary; one 1½ volt, 4 to 5 amp. secondary; one 2¼ volt, 3½ amp. secondary, and one 5 volt, 1 amp. secondary. It is fitted with soldering terminals.

Air-jacketed Motor

Wagner Electric Co., 6400 Plymouth Ave., St. Louis, announces the Wagner CP Air-Jacketed motor. The motor frame is substantially airtight. This is surrounded by a jacket which is open at both ends, with fan blades on an extension shaft between the sealed motor and its outer jacket. This is a polyphase, squirrel-cage motor, made in sizes from 2 to 30 hp. The stator is deeply grooved, to allow for great radiation. It is hot-riveted to the end rings, which are made of heavy malleable iron. The center shield



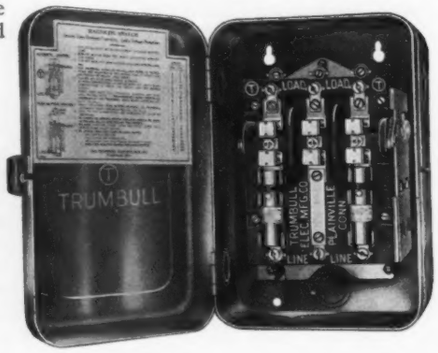
is heavy sheet steel held tightly in place by means of slot-head bolts. The end shield is made of cast iron, rib-reinforced. The shield is easily removable for access to the ventilating fan and bearing. A grating protects the fan and allows it to draw in air. The fan is of one-piece construction and moves a large volume of air at high velocity. The shaft is longer than in standard motors, to allow for mounting the fan. The conduit box is mountable in four positions. Ball bearings lie in a double row, self-aligning in one end plate and deep grooved in the other.

Turbo Oil Tubing

William Brand & Co., 268 Fourth Ave., New York, is marketing a line of varnished cambric (spaghetti) tubing for electrical purposes. This tubing is designed to be uniform, flexible and durable, and to have longer life than rubber tubing under exposure to weather, water, oil and acids.

Motor Starting Switch

Trumbull Electric Mfg. Co., Plainville, Conn., is marketing a magnetic motor starting switch in ratings of 2—5 hp., single phase, and 5—10 hp., polyphase, at 110—550 volts. It is a three phase or two phase (three wire) type. It is so constructed that no flexible connections are required. It has simultaneous double-break contacts which are self-aligning and



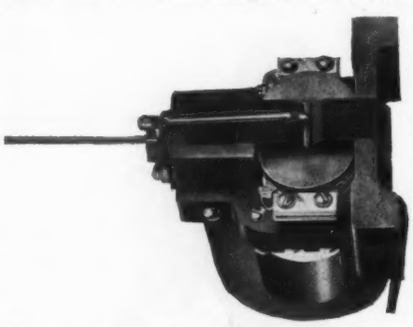
self-cleaning. This switch is of the push-button type. The entire switch mechanism can be removed from its case by loosening three screws.

THE makers of electrical equipment and electrically-driven machine tools and appliances are buying large quantities of raw materials, parts, etc., for their products every year. It is the purpose of the editor of this New Goods section to publish descriptive items on such new materials and devices which will be of interest to the buyers. On this and the preceding page are shown some of the items which are purchased by electrical manufacturers, either for use in the making of their products or for resale with them. The Index of Raw Materials, Parts and Electrical Equipment, published every month in ELECTRICAL MANUFACTURING, gives a comprehensive list of the products suitable for publication in this section. If you have placed one or more of these products on the market recently, kindly let us know about it and we will be glad to announce it for you in this section.

THE EDITOR

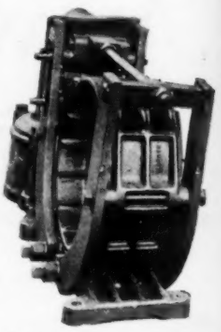
Brielle Reproducing Unit

G. R. Penn Mfg. Co., 34 W. Third Street, New York, has brought out the Brielle B. A. motor designed to be used



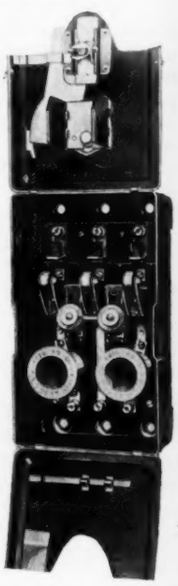
as a reproducing unit in any cone speaker. Laminated pole pieces are used to provide maximum efficiency to the audio frequency energy generated by the coils and also to eliminate eddy currents. The magnetic strength of the magnets is designed not to decline with age. The large size magnets give sensitivity and volume throughout the entire range.

Solenoid Brake



General Electric Co., Schenectady, N. Y., is marketing a solenoid brake, type CR-9516, the brake mechanism and frame of which can be used for both A.C. and D.C. The A.C. and D.C. solenoids are interchangeable. These brakes are especially designed for severe service with mill, crane and hoist motors. The brake mechanism is held in the "off" position by a coil and plunger. When power is applied to the motor, the coil is energized and the brake is released and, when the power is shut off, a spring setting device forces the mechanism into the closed or braking position. The brakes can be mounted in any position and have an adjustable torque. They are self aligning. A small diameter brake wheel is used to minimize flywheel effect. The brake yokes are plate steel. The lining is compressed, woven asbestos.

A.C. Manual Starter



Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis., announce the CH-9115 A. C. motor starter. This is a manual controller of inexpensive design. The cover is divided into two parts, in such a way that the lower part may be opened alone to replace links in the thermal overload cutouts. The cover cannot be opened except when the starter is in the "off" position and all current carrying parts are dead. Overload protection is provided both for starting and running conditions. The starting inrushes are taken care of by a thermal overload cutout. Roller type contacts are provided which break the arc in two places.

Cloth Loud Speaker Lacquer

H. V. Walker Co., 17 John St., New York, has brought out a clear lacquer for coating aeroplane cloth in loud speakers. This lacquer is a selected product having a chemical base, and in the process of manufacture is run through filter presses to extract foreign matter. It is designed to impart a high gloss to the fabric and render it impervious to moisture. A great variety of colors is available. This lacquer is quick drying and shrinks the cloth to a rigid, drumlike tension.

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of **ELECTRICAL MANUFACTURING** is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of **ELECTRICAL RECORD** as heretofore. This Classified Index has been an exclusive **ELECTRICAL RECORD** feature for over thirty-six years.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.

AMMETERS. See Instruments.

ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature.
Bearings. See Bearings.
Blowers. See Blowers, Armature.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

ARMORING MACHINES. See Wire Manufacturing Machines.

ARMS, FLEXIBLE. See Tubing Flexible Metallic.

ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slate. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville, Inc., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Decelceo, Inc., Wayne, Mich.
Johns-Manville, Inc., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zellite. See Decelceo, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbus Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Riddion Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 121 N. Front, Minneapolis, Minn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Motor Platform
Tension Motor Base Co., 15 E. 26th, New York, N. Y.

BASES, Reading Lamp
Metal, Pottery Wood.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.

Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo.
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 24 William, Chattanooga, Tenn.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 317 E. 29th, Chicago, Ill.
Braun Bearings Co., Primos, Pa.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Marlin-Rockwell Corp., Jamestown, N. Y.
Hoffman. See Norma-Hoffman Bearings Corp.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Arguto Oilless Bearings Co., Philadelphia, Pa.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Cleveland Graphite Bronze Co., Cleveland, Ohio.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia, Pa.
United States Graphite Bearing Co., Saginaw, Mich.

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
More-Jones Brass & Metal Co., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y.
Torrington Mfg. Co., Torrington, Conn.

BLUESTONE. See Chemicals, Battery.
BOARD, Fuller. See Cloth and Paper.
BOARD, Press. See Cloth and Paper.
BOWL HOLDERS. See Fixture Fittings.

BOX BOARD
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago,

BRUSHES *for* **ELECTRICAL MACHINERY**
Shipment within 12 hours
Carbon and Graphite Products Co.
227 West Broadway, New York City
Phone: Walker 4124

BOXES, Fibre
Container Corp. of America, Dept. 36, 111 W. Washington, Chicago, Ill.
Corrfibre. See Container Corp. of America.
Mid-West Box Co., Dept. 36, 111 W. Washington, Chicago,

BOXES, Sheet Steel. See Cabinets, Sheet Steel.
BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., Front & Willow Sts., Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Dept. 36, 111 W. Washington Chicago, Ill.
Garr Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Hinde & Dauch Paper Co., 309 Decatur, Sandusky, Ohio. (Wrappers.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago.
National Folding Box Co., New Haven, Conn. (Cartons.)
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.
Thompson & Norris Co., 212 Concord, Brooklyn, N. Y.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Baltimore Copper Smelting & Rolling Co., Baltimore, Md.
Scovill Mfg. Co., Waterbury, Conn.

BREAKERS, Circuit. See Circuit Breakers.
BRIDGES, Wheatstone. See Instruments, Laboratory Standard.
BRONZE. See Brass, Bronze and Copper; also Castings.
BRONZE, Phosphor. See Phosphor Bronze.
BRONZE POWDER, Aluminum. See Aluminum.
BRUSH HOLDERS. See Brushes, Commutator.
BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W

Automotive Mfg. Co., Kansas City, Mo.				H		
B. B. B. See Becker Bros. Elec'l Corp.						
Baylis Co., Bloomfield, N. J.				H		
Becker Bros. Elec'l. Corp., 25 N. Jefferson, Chicago, Ill.	C	W	S	H	L	
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.	C					
Boston Woven Wire Brush Co., Northboro, Mass.		W				
Boxill-Bruel Carbon Co., 308 W. Fourth, Cincinnati, O.	C			H		
Burrows & Co., 1135 W. Van Buren, Chicago	C	W	S	H	I	
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa.	C					
Carbon Engrg. Co., Slinger, Wis.	C				L	
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O.	C					
Carbon & Graphite Products Co., 227 West Broadway, New York, N. Y.	C					
Carenco. See Carbon Engineering Co.						
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y.	C	W	S		L	
Cooley Mfg. Co., 98 Park Place, New York		W				
Diamond C. See Chapin Co., Chas. E.						
Dixon Crucible Co., Joseph, Jersey City						
Electra. See Automotive Mfg. Co.						
Electric Accessories Co., 310 York Ave., Philadelphia, Pa.				H		
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa.						
Eureka Copper Products Corp., North East, Pa.		W	S	H		
Fleck Carbon Co., 508 Broome, New York	C					
Flower, D. R., 1217 Spring Garden, Philadelphia, Pa.				H		
General Electric Co., Schenectady, N. Y.	C			H	L	
Graphalloy. See Graphite Metalizing Corp.						
Graphite Metalizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y.	C			H		
Henrite Products Co., 98 Park Place, New York, N. Y.	C					
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio				H		
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.)	C					
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa.	C					
Kohlenite Products Co., 417 W. 28th, New York, N. Y.	C					
Le Carbone. See Jeandron, W. J.						
Le Valley Vitae Carbon Brush Co., 3608 Grand Central Terminal, New York, N. Y.	C					
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.	C					
Morganite Brush Co., 33-02 48th Ave., Long Island City, N. Y.	C					
National Carbon Co., Cleveland, O.	C					
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa.	C				L	

BRUSHES, Commutator—Continued
No Spar. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W . . . L
Ohio Elec. Specialty Mfg. Co., Troy, O. . . . . W . . . . .
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C . . . . . .
Pure Carbon Co., Wellsville, N. Y. ..... C W S . . L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... W L
Salem Electrical Supply Co., Salem, Mass. . . W . . . . .
Seabury, Ralph L., Factories Bldg., Toledo, O. C . . . . . .
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C . . . . . .
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. ..... C L
Speer Carbon Co., St. Mary's, Pa. ..... C . . . . . .
Stackpole Carbon Co., St. Mary's, Pa. ..... C . . . . . .
Sterling. See Carbon Laboratories Co.
Superior Carbon Products, Poughkeepsie, N. Y. ..... C . . . . . .
U. S. Graphite Co., Saginaw, Mich. ..... C . . . . . .
Unico. See Universal Carbon Co.
Universal Carbon Co., Dundee, Ill. ..... C . . . . . .
Universal. See Graphite Metallizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES FOR VACUUM CLEANERS

Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.
BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass

For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Co., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.
BUNCHING MACHINES. See Wire Manufacturing Machines.
BUSHINGS, SHAFT. See Bearings and Bushings.
CABINETS, Ice Cream. See Refrigerator Cabinets.

CABINETS, Fibre

Diamond State Fibre Co., Bridgeport, Pa.
Vulcawood. See Diamond State Fibre Co.
CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel

Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel Equip. Co., Aurora, Ill.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Gus, 555 W. Monroe, Chicago, Ill.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 72 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1605 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Diamond C. See Standard Elec. Supply Co.
Dowman-Doxier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Box & Switchboard Co., 500 S. Thorp, Chicago.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Electric Apparatus Co., 703 N. Halsted, Chicago, Ill.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 221 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dall Mfg. Co., 606 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
MacMillen, John W., 201 N. Los Angeles, Los Angeels, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Reznloh. See Holzer Sheet Metal Works.
Security. See Aurora Steel Products Co.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
Staten Elec. Mfg. Co., 703 Plymouth Ave., N., Minneapolis.
Superior Switchboard & Devices Co., 420 Schroyer Ave. Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco.
Universal Metal Box & Products Co., 144 Bleecker, Newark.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood

Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Brannin Cabinet Co., 162 Chambers, New York, N. Y.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Chillicothe Furniture Co., Chillicothe, Mo. (Radio.)
Clinton Corp., 342 Madison Ave., New York, N. Y.
Crescent Chair Co., Plymouth, Wis.
Delker Co., Geo., Henderson, Ky.
Detroit Woodcraft Corp., 2260 Hendrie, Detroit.
Donohue Lumber Co., Smith and State, Perth Amboy, N. J.
Ebeo Radio Cabinet Corp., 410 W. 27th, New York, N. Y.
Effein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4820 W. 16th, Cicero, Ill.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
King Mfg. Corp., Rano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
Morris Register Co., Council Bluffs, Ia.
Natural Voice Talking Mach. & Radio Cabinet Co., Oneida, N. Y.
New England Box Co., Greenfield, Mass.
Panelcab. See Weber Electric Wks.
Parker-Young Co., 131 State, Boston, Mass.
Pierson Co., 836 Cedar, Rockford, Ill.
Plymouth Furniture Co., 25 E. Juneau, Milwaukee, Wis.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia.
Radio Mfg. Co., Div. of Pillied Lumber Co., Swanton, O.
Radio Master Corp. of America, Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Roberts & Co., H. T., 1340 S. Michigan Ave., Chicago, Ill.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y.
Schutz Bros., 152 Chambers, New York, N. Y.
Signal Electric Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Stradivara Co., Coshocton, Ohio.
Straus Cabinet Wks., Eugene, Baxter Ave., Louisville, Ky.
Stettner Phonograph Corp., 318 E. 75th, New York.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Swan & Sons, S. N., 1st, Freeport, Ill.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
United Cabinet Mfrs. Corp., 1615 S. Michigan Blvd., Chicago, Ill.
Watsontown Table & Furniture Co., Watsontown, Pa.
Weber Electric Wks., Brooklyn Sta., Cleveland, O.
West Box Co., 235 Liberty, Springfield, Mass.
CABLE ARMORING MACHINES. See Wire Manufacturing Machines.
CABLE TEST SETS. See Instruments, Portable and Switchboard.
CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture

Glass, Fibre Paper.
Brandywine Fibre Products Co., Wilmington, Del.
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibro Products Co., New Bedford, Mass.
Phoenix Glass Co., 230 5th Ave., New York, N. Y.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibro Products Co.
CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.
CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered

Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS

Battery Arc Light.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.
CARTONS. See Boxes and Wrappers.
CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator

Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight

Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1270 Ontario, Cleveland, O.
CASTINGS, Aluminum. See Castings, Aluminum.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.

CASTINGS

Copper, Brass, Bronze, Monel Metal, White Metal.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Bohn Aluminum & Brass Corp., 2599 Isabella, Detroit.
Furies Mfg. Co., Decatur, Ill.
Sterling Art Metal Wks., 61 Grand, New York, N. Y.

CASTINGS, Die

Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Olive Bldg., Pittsburgh.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., New Haven, Conn.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Stewart Die Casting Co., 4509 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.

CASTINGS, Gray Iron

American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
North Wales Mach. Foundry Co., North Wales, Pa.
Snead & Co., Pine St., Jersey City, N. J.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.

CASTINGS, Steel

Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark, N. J.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J.

CEMENT, Commutator

Acme. See Green Equipment Corp.
Armstrong. See Electric Power Maintenance Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Electric Power Maintenance Co., 21 N. Third, Minneapolis.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, O.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 36 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain

Fire Lete. See Technical Products Co.
Insa-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 116 Sheridan Sq., Pittsburgh, Pa.
Thermold. See Technical Products Co.

CHAIN, Socket

American Ball Chain Works, 12 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
United Bead & Chain Co., Irvington, N. J.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier.
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture

Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Furies Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
McKinnen Chain Co., Tonawanda, N. Y.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.
Waterbury Mfg. Co., Waterbury, Conn.

CHAIN, Power Transmission

Baldwin Chain & Mfg. Co., Worcester, Mass.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Whitney Mfg. Co., Hartford, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet

Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Electric Equipment Co., 1240 S. Hope, Los Angeles, Cal.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Elec. Co., 4515 Shaw Ave., St. Louis, Mo.

CHEMICALS, Battery

Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Rd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein & Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
New Jersey Zinc Co., 160 Front, New York, N. Y. (Zinc Chloride.)
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltak. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration

Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride. Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)

CHUCKS, Magnetic

Taft-Pierce Mfg. Co., Woonsocket, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS

Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Schenectady, N. Y.
High Tension Elec'l Specialty Co., Copley Square, Boston.
Hitesco. See High Tension Elec'l Specialty Co.
Inducto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.
Minibraker. See Burke Controller Co.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 208 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Ward Leonard Elec. Co., Mount-Vernon, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
CIRCUIT TESTERS. See Testers, Fuse and Circuit.
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner.
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal

Oakite Products, Inc., 26 Thames, New York, N. Y.
CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug

Gray Bros Co., Piano, Ill.
CLOTH GEARS. See Gears and Pinions, Composition.

CLOTH UNTREATED

Walker Cotton Fabrics Co., 327 S. La Salle, Chicago, Ill. (Cotton Duck)

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CLOTH AND PAPER, Insulating

Cloth, Insulated ..... See C
Paper, Insulated ..... See P
Fibre Paper (Fish Paper) ..... See F
Press Board (Fuller Board) .... See B
Silk ..... See S

Acme Wire Co., New Haven, Conn..... C S P .. ..
Armatite. See Mica Insulator Co.
Brand & Co., Wm., 268 Fourth Ave., New York ..... P . . .
Campbellite. See Campbell Fibre Co.
Campbell Fibre Co., Stanton, Delaware..... B
Carboloid Products Corp., 15 Park Row, New York. N. Y..... C .. P . . .
Case Brothers, Inc., Highland Park, Conn.. . . . . B
Case & Risley Press Paper Co., Oneco, Conn. . . . . .
C-F. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa..... P F B
Chicago Mica Co., Valparaiso, Ind..... C . . . . . .
Dexstar. See Dexter & Sons.
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)
Diamond State Fibre Co., Bridgeport, Pa.. . . . P . . .
Dielectric Mfg. Co., St. Louis, Mo..... C S P .. B
Federal Insulating Corp., Yonkers, N. Y.... C .. P F ..
General Electric Co., Schenectady, N. Y.... C .. P . . .
Hewitt & Bros., C. B., 16 Ferry, New York C .. P . . .
Hi-Tex. See Stevens Paper Mills.
Incella. See Tarentum Paper Mills Co.
Irvington Varnish & Insulator Co., Irvington, N. J. ..... C S P . . .
Manning Paper Co., J. A., Troy, N. Y.... . . . . B
Mica Insulating Co., 200 Varick, New York C S P .. B
National Vulcanized Fibre Co., Wilmington, Del. ..... F . .
New Jersey Wood Finishing Co., Woodbridge, N. J. ..... C . . . . . .
Old Hick. See Hewitt & Bros., C. B.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass. . . . . F . .
Rogers Paper Mfg. Co., South Manchester, Conn. ..... B
Schwettzer, Peter, 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)
Seutan Co., 342 Madison Ave., New York . . . . P . . . .
Sico. See Standard Insulation Co.
Spaulding Fibre Co., Tonawanda, N. Y.. . . . . F . .
Standard Insulation Co., Rutherford, N. J. C S P . . . .
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varised Hard Fibreboard)..... B
Sterlite. See Sterling Firebrand Co.
Stevens Paper Mills, Windsor, Conn..... B
Tarentum Paper Mills Co., Tarentum, Pa.. . . . P . . .
Turbonite. See Brand & Co., Wm.
Union Mills Paper Mfg. Co., New Hope, Pa. .. .. P . . .
West Virginia Pulp & Paper Co., 200 5th Ave., New York..... B

CLUTCHES, Magnetic

Cutler-Hammer Mfg. Co., Milwaukee, Wis.

COIL (Coils).

Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished

Armature, Field, Electromagnet and Induction Coils.
Acme Wire Co., New Haven, Conn.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York.
A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Coilton Elec. Mfg. Co., Easton, Pa.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 2101 Federal, Camden, N. J.
Electrical Products Mfg. Co., Providence, R. I.
Irvington Varnish & Insulator Co., Irvington, N. J.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 212 Mulberry, Toledo, Ohio.
National Elec. Corp., 8 Centre, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 1392 E. 43rd, Cleveland, O.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Robertson, Leo F., 536 West 22nd St., New York, N. Y.
Sevison Magneto Engrg. Co., 538 Fernwood Ave., Toledo, O.
Stung & Barron, 210 E. Pratt, Baltimore, Md.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Universal Winding Co., Boston, Mass.
U. S. Armature Service Co., 1617 S. Michigan Ave., Chicago, Ill.
Whittier & Ditmar, Inc., 1611 Beacon, Brookline, Mass.

COMMUTATOR

Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS

Derby Commutator Co., Derby, Conn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.

COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper.
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor

Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electric Controller & Mfg. Co., 2698 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
Diamond Elec. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 292 Hudson, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover, Milwaukee, Wis.
Maimin Co., H., 247 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd. Chicago, Ill.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md.
Square D Co., 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
U. S. Elec'l Mfg. Co., 200 E. Slauson Ave., Los Angeles
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.

COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.

CORES, RESISTANCE COIL (Lava)

American Lava Corp., 24 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Es-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Fireite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitrocoil. See Thermal Syndicate.

COTTON DUCK. See Cloth, Untreated.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)

Bartlett Hayward Co., Baltimore, Md.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Franke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Lipe, W. C., Syracuse, N. Y.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease

Bowen Mfg. Co., Auburn, New York.
Lunkenheimer Co., Cincinnati, Ohio.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.

CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier

Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschburg, Stutz & Co., 268 4th Ave., New York, N. Y. (Fringes.)
Nelson Head Co., 15 W. 37th, New York, N. Y. (Importer)
Noe & Sons, Wm. R., 43 E. 10th, New York, N. Y.
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia.
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA

Meyercord Co., 133 W. Washington, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS

Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

FIBRE—*cut to any form*

Sheet, Rod, Tubing

MICA

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COTTON TAPES AND SLEEVING

Everything for the Motor

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DIALS, Enameled

Whittier Co., Horace R., Pequabuck, Conn.

DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.
DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS

Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Beaver Machine & Tool Co., Dept. M4, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.

DISCS, Armature

Steel Discs, Laminations, and Segments for Motors and Transformers.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.

DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.
ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES

Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Engravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Luma Elec. Equipment Co., 407 Spitzer Bldg., Toledo, O.
Preis & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel

Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Etch-O-Gravure. See Insuline Corp. of America.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., Newark, N. J.
Roselle Mfg. Co., 215 E. 9th Ave., Roselle, N. J.
Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 12th and Sycamore, Cincinnati, O.
Wright Radio Co., 114 Exchange, Rockland, Mass.

ENGRAVING TO ORDER. See Engraving, Radio Panel.

EYELETS

Platt Bros. & Co., Waterbury, Conn.

FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.
FEET, FELT. See Felt.

FELT

Advance Felt & Cutting Co., 317½ S. Jefferson, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4031 Ogden Ave., Chicago, Ill.

FERRULES

Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.

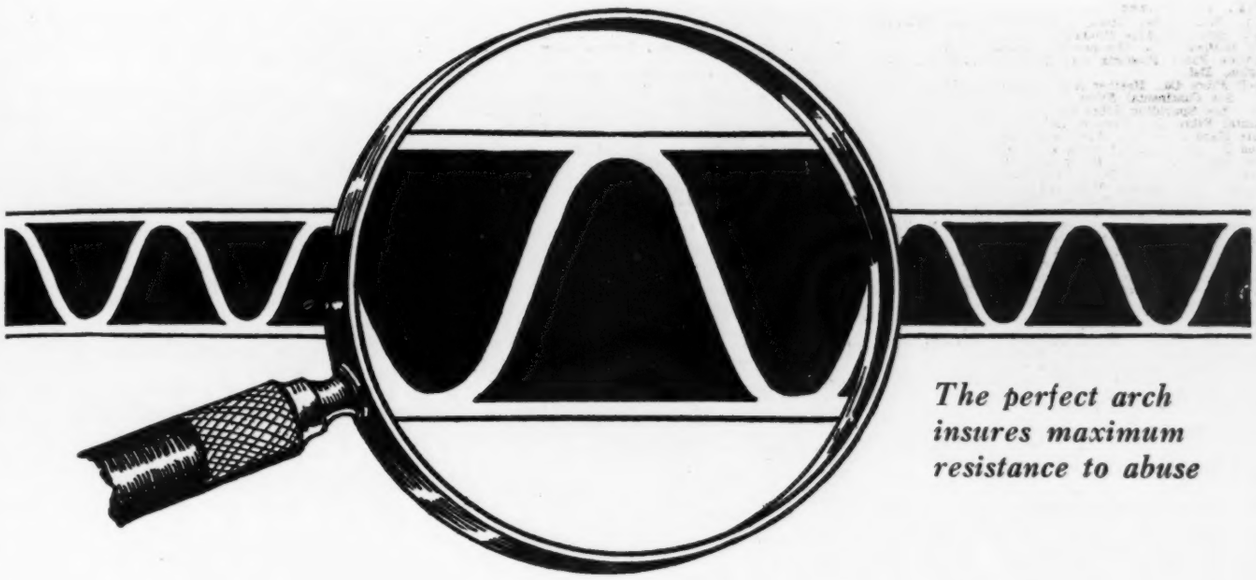
FIBRE BOARD PRODUCTS (Solid and Corrugated)

Container Corp. of America, 111 W. Washington, Dept. H, Chicago, Ill.
Mid-West Box Co., Dept. 6, 111 W. Washington, Chicago.
Sefton Mfg. Corp., 59 E. Madison, Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol

Moisture Proof; Sheet, Rod, Tubes.
Bakelite-Dilecto. See Continental Fibre Co.
Bakelite-Duresto. See Spaulding Fibre Co.
Celoron Co., Bridgeport, Pa.
Continental Fibre Co., Newark, Del.
Fibroc Insulation Co., 423 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite. See National Vulcanized Fibre Co.
Spaulding Fibre Co., Inc., Tonawanda, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.



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Title _____

Firm _____

Address _____

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Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Agasote Millboard Co. (Fernwood), Trenton, N. J.
Brandywine Fibre Products Co., North Walnut St., Wilmington, Del.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Conite. See Continental Fibre Co.
Cocheco. See Spaulding Fibre Co.
Continental Fibre Co., Newark, Del.
Delaware Hard Fibre Co., Wilmington, Del.
Diamond F. See Diamond State Fibre Co.
Diamond State Fibre Co., Bridgeport, Pa.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Agasote Millboard Co.
Fibre Products Co., New Bedford, Mass.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Iten Fibre Co., 2359 E. 67th, Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Diamond State Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.
FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

FILAMENTS, Incandescent Lamp
Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 14th and Willow Ave., Hoboken, N. J.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting
Ideal Commutator Dresser Co., 1039 Park, Sycamore, Ill.
Martindale Electric Co., 1364 W. Fourth, Cleveland, O.
FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps ..... H
American Chain Co., Bridgeport, Conn. (Loops and Rings.) ..... B
American Pin Co., Waterbury, Conn. I
American Ring Co., Waterbury, Conn. (Candle.) ..... S
Ampinco. See American Pin Co.
Anderson Co., Jacob, 253 3rd Ave., So. Minneapolis, Minn. ..... B
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill. ..... B I
Arco. See American Ring Co.
Arrow Electric Co., Hartford, Conn. ..... S
Banlite. See East Side Metal Spinning Co.
Banner. See Plume & Atwood Mfg. Co.
Barton Brass Wks., 3627 Superior, Detroit. ..... B
Belmet. See B. & L. Metal Stamping Co.
Block Bros. Mfg. Co., 89 Walker, New York. ..... B
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit. ..... B
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.) ..... B I
Bryant Elec. Co., 1421 State, Bridgeport, Conn. ..... S
B. & L. Metal Stamping Co., 155 Jamaica Ave., Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.) ..... B I H
Cambridge Brass Co., Cambridge, Mass. ..... B
Cleanezy. See Dunlap Co.
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J. ..... B S
Crescent Brass Mfg. Co., Reading, Pa. ..... B
Crouse-Hinds, Solvay Sta., Syracuse, N. Y. ..... S H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.) ..... B I
Dunlap Co., John, Carnegie, Pa. ..... S
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y. ..... B
Economy. See National Metal Molding Co.
E-Z Up. See Plume & Atwood Mfg. Co.
Faries Mfg. Co., Decatur, Ill. ..... B I S H
Fisherty Co., M. E., 28 S. Clinton, Chicago. I
Fralick Co., S. R., 15 S. Clinton, Chicago. I
Franklin Brass Foundry Co., Reading, Pa. ..... B
Friedley-Voshardt Co., Chicago. ..... B
Full-O-Lite Co., 723 S. Halstead, New York, N. Y. ..... B
General Electric Co., Schenectady, N. Y. ..... S
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O. I
Guth Co., Edwin F., 2625 Washington Ave., St. Louis, Mo. ..... S
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... S
Incandescent Supply Co., 468 West Broadway, New York, N. Y. ..... B H
Isco. See Incandescent Supply Co.
Jiffy. See White Mfg. Co., J. H.
Jones Brass & Iron Specialty Co., 1820 W. 22nd, Chicago, Ill. ..... B I
Kwikon. See Fralick Co., S. R.
Lakin. See Thomas & Betts Co.
Lanco Mfg. Co., 233 Jeliff Ave., Newark, N. J. (Cross Bar.) I
Liberty Brass Turning Co., 203 Lafayette, New York, N. Y. I
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y. ..... B I
Liberty Machine Co., Wauwatosa, Wis. ..... B I
L & K Mfg. Co., 440 Adelphi, Brooklyn, N. Y. ..... H
L. & W. Brass Wks., 820 Orleans, Chicago, Ill. ..... B

Madelite. See Belson Mfg. Co.
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y. I
Macallen Co., Foundry St., Boston, Mass. I
Manhattan Brass & Elec. Co., 30 Warren, New York, N. Y. ..... B
Metal Products Co., 210 Canal, New York. ..... B
Metro Iron Ornament Co., 191 Christie, New York, N. Y. I
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y. ..... B
Mid-West Chandelier Co., Kansas City, Mo. ..... B
Mitchell-Vance Co., 503 W. 24th, New York. ..... S
Monarch. See Perfeclite Co.
Murlin Mfg. Co., Philadelphia, Pa. ..... B I
National Metal Moulding Co., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.) I
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E. Cleveland, O. ..... H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. ..... B
Nobolt. See Fralick & Co., S. R.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. I
Onli. See Perfeclite Co.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. ..... B S
Peerless Products Line, 200 Holliday, Baltimore, Md. ..... B H
Perfeclite Co., 1457 E. 40th, Cleveland. ..... S
Pittsburgh Valve & Fittings Co., Barberton, O. I
Plume & Atwood Mfg. Co., Waterbury, Conn. ..... B S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Reading Brass Co., 141 Schiller, Reading, Pa. ..... B I
Rodale Mfg. Co., 200 Hudson, New York. ..... B H
Sandow Tool Co., 1440 Broadway, New York. ..... S
Schroeder Lamp Wks., Jersey City, N. J. ..... B
Scovill Mfg. Co., Waterbury, Conn. ..... B I
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Smoot-Holman Co., Inglewood, Cal. (Ceiling Reflectors) ..... B
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabler Mfg. Co.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia. ..... B
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. ..... S
Standard Metal Spinning Co., 128 Mott, New York, N. Y. ..... B
Star. See Perfeclite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. I
Steele & Johnson Mfg. Co., Waterbury, Conn. ..... B S
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) ..... B
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York. I
Triumph Mfg. Co., 310-13, West New York, N. J. ..... S
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. ..... B
Vandy, B. A., 7 Prospect St., Rochester, N. Y. ..... H
Vester, Sons, Alfred, 5 Mason, Providence, R. I. ..... B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6108 Longfellow Ave., Cleveland, O. ..... B
Walden Tool & Metal Mfg. Co., New Haven Conn.
Wa-Me-Co. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. ..... B
Waterbury Mfg. Co., Waterbury, Conn. ..... B S
Waterbury Metal Wares Co., Waterbury, Conn. ..... S
Weber Brass Co., Whitney Power Block, Cleveland, O. ..... B
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y. ..... B S
Zamora. See American Pin Co.

FLASHERS, Sign
Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 706 Russia, San Francisco, Cal.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Diamond. See General Appliance Corp.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
Grazier Elec'l Products Co., Johnstown, Pa.
Horn Signal Mfg. Co., 292 Hudson, New York, N. Y.
Hotchkiss. See Cramblet Engineering Corp.
Jewel Elec. & Mfg. Co., 4505 Ravenswood Ave., Chicago, Ill.
Jimbetts. See Betts, Inc., James H.
Killark. See Betts & Betts Corp.
Magnetic Sign Flasher Co., Seattle, Wash.
Mercury. See Betts, Inc., James H.
Norden Co., 132 W. 43rd, New York, N. Y.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products, Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Puritan Elec. Circuit Breaker Corp., 1 E. 42nd, New York.
Reco. See Reynolds Elec. Co.

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FUSE PLUG
The plug that can be refilled with standard fuse wire.
F. W. POWELL
119 W. Ohio St., Pittsburgh, Pa.

Reynolds Elec. Co., 2622 W. Congress, Chicago, Ill.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veelar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y.
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.
FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.
FLEXIBLE SHAFT. See Tubing, Flexible Metallic.

FORGINGS, Non-Ferrous
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Kalman Steel Co., 1844 W. Austin Ave., Chicago, Ill.
Master. See Armature Coil Equipment Co.

FORMS, Wire
Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport, Conn.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Kalman Steel Co., 1844 W. Austin Ave., Chicago, Ill.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Murray Hill Wire Frame Co., 314 E. 32nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Timberlake & Sons, J. B., Jackson, Mich.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.
FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS
Sherman Mfg. Co., H. B., Battle Creek, Mich.
FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

	KEY
Cartridge	See C
Plug	See P
Non-Refillable	See N
Refillable	See R
Open Link	See O
Fuse Wire	See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... P
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Co., Hartford, Conn. ..... P N
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. ..... P
Belden Mfg. Co., 2310B, S. Western Ave., Chicago, Ill. C
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussmann Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis ..... C P N R O
C. E. Z. See Automatic Elec. Iron & Fuse
Chase-Shawmut Co., Newburyport, Mass. ..... C P N R O
Chicago Jefferson Fuse & Electric Co., 1505 W. 15th St., Chicago, Ill. ..... C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. (Automobile) ..... C N R
Cote Bros. Mfg. Co., 182 W. Lake, Chicago, Ill. ..... C P R
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh ..... C R
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... C P N R
Eco. See Economy Fuse & Mfg. Co.
Efficiency Fuse Co., East Palestine, O. C
Electric Fuseguard Co., Charlottesville, Va. ..... C P N R
Elliott Electric Co., Shreveport, La. C
Gem. See Chicago-Jefferson Fuse & Electric
General Electric Co., Schenectady, N. Y. ..... C N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. ..... C R
H. & H. See Hart & Hegeman Mfg. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. ..... P R O
Hudson Wire Co., Ossining, N. Y. C
Kantark. See Trico Fuse Mfg. Co.
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. C
Merrill Mfg. Co., 50 State, Boston, Mass. C
Monarch Fuse Co., Jamestown, N. Y. ..... C N R
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y. ..... C P R O
Platt Bros. & Co., Waterbury, Conn. C
Powell, F. W., 119 W. Ohio, Pittsburgh. ..... P R
Ree-Nu-It Elec. Co., New Bedford, Mass. ..... C P R
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. ..... C R
Royal Elec. Co., Chelsea Station, Boston. ..... P N
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. ..... C P R
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee ..... C P N R
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING
Cattie & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.
GALVANOMETERS. See Instruments, Laboratory Standard.

GASKETS, Rubber
Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York.
Canfield Rubber Co., Bridgeport, Conn.

"This Solves the Problem of INSULATION!"

For many weeks the engineering and production departments in the plant of a large manufacturer of electrical appliances had been having daily conferences on the subject of insulating materials. All kinds of materials were tested and results noted.

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FIBROC-BAKELITE was selected as the most economical, efficient and durable insulation material under test.

Facts brought to light about FIBROC-BAKELITE showed that this material possessed the following characteristics:

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2. *Chemically inert, being unaffected by ordinary solvents.*
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4. *Great mechanical strength, combined with compactness and light weight.*
5. *Heat resistant, constant 225° F.; intermittant, 275° F.*

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FIBROC

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GAUZE BRUSHES, Wire. See Brushes, Commutator.

GEARS (Speed Changing Units)

Cleveland Worm & Gear Co., Cleveland, Ohio.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
Heli-Spur. See Horsburgh & Scott.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Co., R. D., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Philadelphia, Pa.
Smith, Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Philadelphia Gear Wks., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Celoron Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Diamond State Fibre Co.; Bridgeport, Pa.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
Horsburgh & Scott Co., Cleveland, Ohio.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Perkins Machine & Gear Co., 130 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GENERATORS, Electroplating. See Plating Generators.
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture.
GLASS LETTERS. See Letters, Sign.

GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Amelites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 195 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Berylite. See Plaut & Co., L.
Camia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestallite. See Gleason-Tiebout Glass Co.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Decora. See Macbeth-Evans Glass Co.
Delfos-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle (Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Bros. Glass Co., Wellsburg W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Fort Pitt-Jeannette Glass Co., Jeannette, Pa.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletteco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivre. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kaufield Glass & Ceramic Co., Star City, W. Va.
King-Tutankhamen. See Macbeth-Evans Glass Co.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
MacBeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
Marbe. See Phoenix Glass Co.
McFaddin & Co., H. G., 32 Warren, New York, N. Y.
Melilite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. C. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.

Pastelle. See Consolidated Lamp & Glass Co.
Pearltone. See Inland Glass Co.
Persian. See Gillinder & Sons, Inc.
Phene. See Phoenix Glass Co.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasgo. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestepal. See Gleason-Tiebout Glass Co.
Quezal Art Glass & Decorating Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.
Thebian. See Macbeth-Evans Glass Co.
Translux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Velaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells

Bevin Bros. Mfg. Co., East Hampton, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Reiter, G. C., Canton, O.
Waterbury Mfg. Co., Waterbury, Conn.

GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard; also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons

Allen, Chas. E., Pequabuck, Conn.
American Ename' Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
ICE CREAM CABINETS. See Refrigerator Cabinets.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation

Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.

INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard; also Instruments, Pocket.

INSTRUMENTS, Pocket

Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., Garrison Place and French St., Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec'l Products Co., Marquette Bldg., Detroit, Mich.
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tiffany Mfg. Co., Newark, N. J.
Weston Elect. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Laboratory Standard

Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscillographs.)
Cambridge Instrument Co., Ossining, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill.
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Hickox Elec'l Instrument Co., 10514 Dupont, Cleveland, O.
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pyroelectric Instrument Co., Easton, Pa.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Simplex. See Leeds & Northrup Co.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa.
Vawter. See Thompson-Levering Co.
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y. (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elect. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Portable and Switchboard

This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.
See Also Instruments, Pocket; Also Instruments, Laboratory Standard.
Beck Bros., 3640 N. Second, Philadelphia, Pa.
Beede Instrument Co., 136 Liberty, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Ossining, N. Y.
Crit-Point Meters. See Illinois Testing Laboratories.
Dongan Electric Mfg. Co., 2985 Franklin, Detroit, Mich.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Appliance Co., 99 Broadway, Paterson, N. J.
Electric Mfg. Co., 966 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5225 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Grund-Ohmer. See Sticht & Co.
Hickox Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Co., 857 Boylston, Boston, Mass.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
Jaynes, R. F., Lynn, Mass.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Leeds & Northrup Co., 4901 Stanton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn N. Y.
Multi-Volt Trouble Finder. See Weiford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 23 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pignolet Instrument Co., 76 Greenwich, New York, N. Y.
Pin-Jack. See Weston Elec'l Instrument Co.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Sticht Co., H. H.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Superkeen Company, Salisbury, N. C.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Stitcht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Weiford, Jr., Geo. W., 5415 Thomas Ave., Philadelphia, Pa.
Weinberg & Co., 870 Blue Island Ave., Chicago, Ill.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)

Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint and Varnish.
Paper. See Cloth and Paper Insulating.
Porcelain. See Porcelain.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS

Artos Engrg. Co., Milwaukee, Wis.

INSULATION MIXERS

Baker Perkins Co., Saginaw, Mich.

INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy

Diamond State Fibre Co., Bridgeport, Pa.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Macallen & Foundry, Boston, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.

IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass

For Composition Jars. See Molded Insulation; also Rubber.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Rodefer Glass Co., Bellaire, O.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing

Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y.
Wennstrem's Sons Co., John, Sufforn, N. Y.
Worley Jewel Co., John, Waltham, Mass.
Universal. See Oefinger, J. L.

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JOINTS, Fixture Insulating

Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Macallen & Foundry, Boston, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co. P. W., 3220 North Ave., Milwaukee.
White & Co., O. C., 17 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.

LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.

LACQUER, ARMATURE. See Paint, Varnish and Lacquer, Metal. See Paint, Varnish and Lacquer.

LAMINATIONS. See Discs, Armature.

LAMP BASES. See Bases, Reading Lamp.

LAMP BULBS (Unfinished). See Bulbs, Glass.

LAMP FILAMENTS. See Filaments, Incandescent Lamp.

LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.

LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES

(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Cincinnati Lathe & Tool Co., 3207 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

LAVA. See Cores, Resistance Coil.

LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.

LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES

Sign Letter, Flashlight, Projector and Reflector.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Clinton Sign Co., Clinton, Ia.
Consolidated Lamp & Glass Co., Coraopolis, Pa. (Flashlight)
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Gilligan Glass Products Co., New Philadelphia, Ohio.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Lights Co., 30 W. 15th, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)

LETTERS, Sign

Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 652 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 8700 S. State, Chicago, Ill. (Metal.)
Grammes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs Inc., 2736 Wentworth Ave., Chicago, Ill.
Opalite Corp., 201 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature

Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

LININGS, Socket

Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.

LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.

LOUD SPEAKERS

Manufacturers Units for Portable & Built-in Types.
Air-Chrome. See Temple, Inc.
Amplion Corp. of America, 531 W. 37th, New York, N. Y.
Aristocrat Corp. of America, 125 W. 23rd, New York, N. Y.
Associated Radio Corp., Ann Arbor, Mich.
Balsa Wood Reproducer Corp., 331 Madison Ave., New York.
Borkman Radio Corp., 230 E. Ohio, Chicago, Ill.
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Double Duty. See Aristocrat Corp. of America.
Dymac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 22nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Enaco. See Engineers Service Co.
Fenco Cone Co., 55½ Murray, New York, N. Y. (Kit.)
Fergus Co., 235 Elizabeth Ave., Newark, N. J.
Firth Radio Co., 25 Beaver, New York, N. Y.

G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Lata Balsa. See Balsa Wood Reproducer Corp.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Co., 191 Joralemon, Brooklyn, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products. 219 W. Chicago Ave., Chicago, Ill.
Mozart-Radiocelve. See Fergus Co.
Newcombe-Hawley, Inc., St. Charles, Ill.
Newton Pressed Steel & Mfg. Co., Newton, Mass.
O'Neil Mfg. Co., West New York, N. J.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.
Powertone Elec. Co., 222 Fulton, New York, N. Y. (Kit.)
Puropower. See Platter Cabinet Co.
Racon Elec. Co., 18 Washington Place, New York, N. Y. (Horn only.)
Radio Cabinet Co., 2118 Gale, Indianapolis, Ind.
Radiolux. See Amplicon Corp. of America.
Raliotive Corp., 21st Ave. and 53rd, Brooklyn, N. Y.
Radiotone. See Reichmann Co.
Red Lion Cabinet Co., Red Lion, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swcboda Co., Maritime Bldg., Seattle, Wash.
Teletone Corp. of America, Third St. & Van Alst Ave., Long Island City, N. Y.
Temple, Inc., 1925 S. Western Ave., Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Scattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Vitalitone Radio Corp., 203 6th Ave., New York, N. Y.
Vocoloud Units. See Firth Radio Co.
Woolf, J. W. & W. L., 227 Fulton, New York, N. Y.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper

Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
French Mfg. Co., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

KEY

Luminous Compound .....See C
Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... P
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., 1421 State, Bridgeport, Conn..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.
Eagelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y..... P
General Electric Co., Schenectady, N. Y..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman Mfg. Co., Hartford, Conn..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luma Lite. See Radium Dial Co.
Luminite Corp., 24 Scott, Newark, N. J..... S P
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C P
Reynolds Spring Co., Jackson, Mich..... S
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y..... C S P

MACHINE SCREWS. See Screws, Machine.

MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES

Armature Banding. See Banding Machines, Armature.
Armature Notching. See Notching Machines, Armature.
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making.
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making

For Making Incandescent Lamps and Vacuum Tubes.
Arrow Mach. Co., 527 Hackensack Plank Rd., Union City, N. J.
Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass. (Vacuum Pumps.)
Dwyer Machine Co., Lynn, Mass.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
General Engineering & Supply Co., 160 5th Ave., New York, N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines.

MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.

MAGNET CHARGERS. See Chargers, Magnet.

MAGNET STEEL. See Steel, Magnet.

MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.

MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.

MAGNETIC CHUCKS. See Chucks, Magnetic.

MAGNETIC CLUTCHES. See Clutches, Magnetic.

MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent

Bullens Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chicago.
Rogers Drop Forging Co., 42 Frank, Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Sticht & Co., H. H., 13 Park Row, New

MANGANESE, Battery. See Chemicals, Battery.

MEASURING INSTRUMENTS. See Instruments.

MEGOHMMETERS. See Instruments, Laboratory Standard.

MERCURY SWITCHES. See Switches, Mercury.

METAL CLEANERS (Compound). See Cleaners, Metal.

METAL CUTTING OUTFITS. See Welding and Cutting Outfits.

METAL MARKING OUTFITS. See Engraving Machines.

METALLIC SHADES. See Shades, Metallic.

METERS. See Instruments.

MICA SHADES. See Shades, Mica.

MICA TAPE. See Tape, Mica.

MICA UNDERCUTTERS. See Slotting Machines & Tools, Commutator.

MICA

Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Dielectric Mfg. Co., St. Louis, Mo.
Fillion., S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co. Otto, 14 Lispenard, New York, N. Y.
Hirsch Mica Co 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa.
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Macallen and Foundry, Boston, Mass.
Micabond. See Chicago Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 154 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Minerals & Insulation Co., 101 Spring, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals Co., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K, 804 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.

MIXERS, INSULATION. See Insulation Mixers.

MOLDED

Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.

MOLDED INSULATION

Aico. See American Insulator Corp.
Alden Mfg. Co., 52 Willow, Springfield, Mass.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., 52 Vanderbilt Ave., New York, N. Y. (Hot and Cold.)
Amerine. See American Insulator Corp.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.
Celoron Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Compo Products Corp., 222 Passaic, Passaic, N. J.
Charmond Elec. Corp., 30 Church, New York, N. Y.

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A series of puncture and flash-over tests, recently conducted by competent engineers conclusively proves the outstanding quality of MICABOND

PUNCTURE TEST .025" PLATE

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
27,416 Volts	22,171 Volts	23,212 Volts
Volts per mil of thickness computed from average breakdown voltage.		
1,097 Volts	1,109 Volts	1,161 Volts

No surface leakage during puncture tests was noted.

FLASH-OVER TEST (DRY)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,690 Volts	19,120 Volts	18,610 Volts

FLASH-OVER TEST (After Standing in Humid Air 24 Hours)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,970 Volts	18,440 Volts	18,460 Volts

SECOND READING (Electrodes in Same Position as in First Reading)

MICABOND No. 101 Molding Plate	MICABOND No. 104 Amber Segment Plate	MICABOND No. 102 India Segment Plate
18,770 Volts	18,560 Volts	18,290 Volts

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BAKELITE MOULDERS

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Molded Insulation—Continued
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colasta Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Diemoulding Production Co., Canastota, N. Y.
Dimco. See Dayton Insulating Moulding Co.
Durex. See General Plastics, Inc.
Durite. See Stokes & Smith Co.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Federal Insulating Corp., Yonkers, N. Y.
Fedrelin. See Federal Insulating Corp.
Fenoline. See Insuline Corp. of America.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 16 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Hemmit. See Garfield Mfg. Co.
Hercules Powder Co., Wilmington, Delaware.
Hi-Heet. See Insulation Mfg. Co.
Hi-Tensit. See Boonton Rubber Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Impreco. See Insulation Products Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., 564 Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Elyria, O.
Isolantite Co. of America, Inc., Bellville, N. J.
Johnson Molding & Tool Co., Weymouth, Mass.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Keystone Specialty Co. (Lakewood) Cleveland, O.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Lavamix. See Splitdorf Radio Corp.
Macallan Co., Macallan and Foundry Sts., Boston, Mass.
Mack Molding Co., Little Falls, N. Y.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 300 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
New England Products Co., 232 Greenwich, New York, N. Y.
National Lead Co., 111 Broadway, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonoid. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Paneityte Co., Enterprise Ave., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolic. See Scranton Button Co.
Pruven Composition Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Renite. See Nixon Nitration Works.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Elec. & Mfg. Co., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfr. Co., Hoosick Falls, N. Y.
Splitdorf Radio Corp., Newark, N. J.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Synamix. See Garfield Mfg. Co.
Textolite. See General Elec. Co.
Thermoplax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.

The Chandler Co.

Name Plates

Springfield Mass.

Union Insulating Co., Parkersburg, W. Va.
Vulcabeston. See Colt's Patent Fire Arms Mfg. Co.
Waterbury Button Co., Waterbury, Conn.
Watertown Mfg. Co., Watertown, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

MOLYBDENUM

Elkon Wks. (subsidiary of P. R. Mallory Co.), Portchester, N. Y.
Lohfeld & Co., J., L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire & Contact Co., 255 Sherman Ave., Newark, N. J.

MONEL METAL

International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform.
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).

MOTORS

Alternating Current ..... See S
Direct Current ..... See S
Motors, 1 Hp. up ..... See M
Motors Fractional Hp. ..... See F
Universal ..... See U

Ace. See A. C. Dayton Co.
A. C. Dayton Co., 308 E. 1st, Dayton, O. ..... F S ..
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland M .. .. ..
Actodector. See Roth Bros. & Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis. ..... M .. S ..
Allis Co., Louis, Milwaukee, Wis. ..... M .. S ..
American Brown Boveri Elec. Corp., 165 Broadway, New York, N. Y. ..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis. ..... M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. .. ..
A. B. S. See Westinghouse Elec.
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago .... F S U
Bogue Elec. Co., Chas. J., 132 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O. ..... M F .. ..
Burke Elec. Co., Erie, Pa. ..... M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 812 Lafayette, Toledo, O. .... F .. ..
Cab. See Westinghouse Elec. Mfg. Co.
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S ..
Chandeyssen Elec. Co., St. Louis, Mo. ..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. ..... M .. .. ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O. ..... M .. S ..
Cleveland Elec. Motor Co., 5213 Windsor Ave., Cleveland, O. ..... M F S ..
Colonial Fan & Motor Co., Warren, O. ..... M F S U
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind. .... S U
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cushman Elec. Co., Concord, N. H. ..... M F S ..
Day-Fan Electric Co., Dept. A, Dayton, O. .... F S ..
Diehl Mfg. Co., Elizabeth, N. J. ..... M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O. .... S U
Dumore. See Wisconsin Elec. Co.
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. ....
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J. ..... M .. S ..
Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, Mo. ..... M F S U
Engbergs Elec. & Mechl. Works, St. Joseph, Mich. ..... M .. S ..
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., Chicago, Ill. ..... M F .. ..
Fidelity Elec. Co., Lancaster, Pa. ..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn. .... F .. ..
Fynn Welchsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. ..... F .. S ..
General Elec. Co., Schenectady, N. Y. ..... M F S U
Gilbert Co., A. C., New Haven, Conn. .... F .. U
Hamilton Beach Mfg. Co., Racine, Wis. .... F S U
Hobart Bros. Co., Troy, O. ..... M .. S ..
Holtzer-Cabot Elec. Co., 125 Amory, Boston... M F S ..
Howell Elec. Motors Co., Howell, Mich. ..... M .. S ..
Ideal Elec. & Mfg. Co., Mansfield, O. ..... M .. S ..
Imperial Electric Co., Akron, O. ..... M .. S ..
Janette Mfg. Co., 556 W. Monroe, Chicago .... F S ..
Jants & Leist Elec. Co., Cincinnati, O. ..... M F .. ..
Jeannin Electric Co., Toledo, O. ..... M F S ..
Kan-Dor Elec. Co., 1821 E. 59th, Los Angeles M .. .. ..
Kendrick & Davis Co., Lebanon, N. H. .... F S ..
Kimble Elec. Co., 634 N. Western Ave., Chicago M .. S U
King Elec. Co., 35 Murray, New York ..... M .. .. ..
Knapp Elec. Corp., Portchester, N. Y. .... F S U
Leland Elec. Co., Dayton, O. .... F S ..
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio ..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O. ..... M .. .. ..
Mando Co., Syracuse, N. Y. .... F .. ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marble-Card Elec. Co., Gladstone, Mich. ..... M .. .. ..
Master Electric Co., Linden and Master Aves., Dayton, O. ..... M F S ..
MC. See General Electric Co.
Metergram. See Bodine Elec. Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
Northwestern Elec. Co., 408 S. Hoyne Ave., Chicago, Ill. ..... M .. S ..
Northwestern Mfg. Co., 480 Clinton, Milwaukee M .. .. ..
Ohio Elec. & Controller Co., 5904 Maurice Ave., Cleveland, Ohio .... F S ..
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Pan. See Chandeyssen Elec. Co.
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Ra-Lite. See Acme Elec. & Mfg. Co.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. ..... M .. S ..
Reynolds Electric Co., 2622 W. Congress, Chicago .. F S ..
Robbins & Myers Co., Springfield, O. ..... M F S U
Rochester Elec. Products Corp., Rochester, N. Y. M .. S ..
Rotator. See Bodine Elec. Co.
Roth Bros. & Co., Chicago, Ill. ..... M .. S ..
Standard. See Robbins & Myers Co.

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Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal. ..... M .. S ..
Stow Mfg. Co., Binghamton, N. Y. ..... M F S ..
Sturtevant Co., Boston, Mass. ..... M F S U
Sunlight Electrical Mfg. Co., Warren, O. .... F S ..
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Triumph Elec. Corp., Carthage, O. ..... M .. S ..
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa. ..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles ..... M .. S ..
Usemco. See U. S. Elec. Mfg. Co.
Valley Elec. Co., 4515 Shaw Ave., St. Louis, Md. M .. S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. ..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va. ..... M .. S ..
Watson. See Allis Co., Louis.
Welco Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1632 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., Cincinnati, O. ..... M .. S ..
Wisconsin Elec. Co., 59 16th, Racine, Wis. .... F .. U
Woods Mach. Co., S. A., Boston. ..... M F S ..
W-P Corp., Cairo, Ill. .... F S ..
Zobell Elec. Motor Co., Garwood, N. J. ..... M .. S ..

NAME PLATES

See also Decalcomania.
American Name Plate Co., 117 Imlay, Brooklyn, N. Y.
Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Celoron Co., Bridgeport, Pa.
Chandler Co., Springfield, Mass.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Etched Products Corp., 90 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
Grammes & Sons Inc., L. F., Allentown, Pa.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. Y.
Waterbury Button Co., Waterbury, Conn.

NOTCHING MACHINES, Armature

Ferracute Machine Co., Bridgeton, N. J.

OHMMETERS. See Instruments, Laboratory Standard; also Instruments, Portable and Switchboard.
OIL-LESS BEARINGS. See Bearings, Oil-less.
OSCILLOSCOPES. See Instruments, Laboratory Standard.

OVENS, Industrial and Laboratory

Drying, Conditioning, Enameling, Japanning.
Temper Drawing, Mold Baking, Vulcanizing.
Vacuum Impregnating.

Buffalo Fdry. & Machine Co., 1543 Fillmore, Buffalo, N. Y. (Armature and Coil.)
Despatch Oven Co., 120 First Ave., N., Minneapolis, Minn.
Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
Devine Co., J. P., Buffalo, N. Y.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas. See Thermo Elec. Instrument Co.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y.
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 198 Piedmont, Waterbury, Conn.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Miho Co., 717 Sycamore, Cincinnati, O.
Oven Equipment Co., New Haven, Conn. (Coil Driers.)
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Sargent & Co., E. H., Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Simplex Elec. Heating Co., 85 Sidney, Cambridge, Mass.
Standard Elec. Stove Co., Toledo, Ohio.
Steiner & Co., H. E., 197 E. Kinney St., Newark, N. J.
Swartwout Co., 18532 Euclid Ave., Cleveland, O.
Thermo Elec. Instrument Co., 1206 Grove, Irvington, N. J.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Young Bros. Co., 6500 Mack, Detroit, Mich.

OXIDES, Battery. See Chemicals, Battery.

PACKING

Cooke Seal Ring, Dept. B. 46 N. Green St., Chicago, Ill.

PAINT, Varnish, Lacquer

KEY
Varnishes, Insulating ..... See V
Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof.. See P
Lacquer, Metal Finishing ..... See L

Acme White Lead & Color Wks., 850 St. Aubin Ave., Detroit, Mich. L
Acme Wire Co., New Haven, Conn. ..... V ..
Acmewire. See Acme Wire Co.
Ajax. See Sherwin-Williams Co.
Alaks. See Lacquer & Chemical Corp.
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. ..... V ..
American Lastite Co., 3166 Lincoln Ave., Chicago.. .. P L
Antakwa Co., 1329 Mohawk, Chicago, Ill. .... P ..

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Armlac. See Robertson Chemical Co.
Arolac. See Arizona Lacquer Mfg. Co.
Art-O-Craft. See Southwestern Paint & Varnish Co.
Atom Chemical Co., 78 E. 10th, New York, N. Y. L
Bakelite Corp., 247 Park Ave., New York, N. Y. L
Belden Mfg. Co., 2310B, S. Western Ave., Chicago
Benolite Co., 501 Columbia Bank Bldg., Pittsburgh. V P . .
Berry Bros., Levi & Wight, Detroit, Mich. . . . . V . . .
Billings-Chapin Co., 1163 E. 40th, Cleveland, O. . V . . .
Bradley-Hurtz Co., 2626 S. Dearborn, Chicago, Ill. L
Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. . . . . V P . .
Carboloid Products Corp., 15 Park Row, New York. V P . .
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. . . . . V P . .
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzens, Columbus, O. V . . . .
Comulac. See Martindale Elec. Co.
Dampney Co. of America, Boston, Mass. . . . . V . . .
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P . .
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del. . . . P . .
Eastman Kodak Co., Rochester, N. Y. L
Eclipse Paint & Mfg. Co., Cleveland, O. . . . . P . .
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York. L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O. L
Federal Insulating Corp., Yonkers, N. Y. . . . . V P . .
Flex-ib-lac. See Dielectric Mfg. Co.
Franche & Co., 440 Orleans, Chicago, Ill. L
General Elec. Co., Mds. Dept. Bridgeport, Conn.. V P . .
George Co., P. D., St. Louis, Mo. . . . . V . . .
G. E. See General Elec. Co.
Glidden Co., Cleveland, O. . . . . V P L
H. B. See Maas & Waldstein Co.
Hercules Powder Co., Wilmington, Del. . . . . V . . .
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. . . . . V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P . .
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. . . . . P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. & Co., 450 E. 3rd, Dayton, O. . . . . V P . .
Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P . .
Lucote. See Lucas & Co., John.
Maas & Waldstein, 45 John, New York, N. Y. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. . . . . V P . .
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O. . . . . V . . .
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York. . . . V . . .
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P . .
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. . . . L
O'Brien Varnish Co., South Bend, Ind. . . . . V P L
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. . . . . P . .
Opex. See Sherwin-Williams Co.
Ozite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
Pacoria Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. . . . L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. . P L
Republic Varnish Co., 200 Thomas, Newark, N. J. V . . .
Robertson Chemical Co., 9805 Meech Ave., Cleveland, O. . . . . V P . .
Rockbestine. See Rockbestos Products Corp.
Rockbestos Products Corp., New Haven, Conn.
Ruberoid Co., 95 Madison Ave., New York, N. Y. . . P . .
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Ninth Ave., Schenectady, N. Y. . . . . V P . .
Sherwin-Williams Co., Cleveland, O. . . . . V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. L
Southwestern Paint & Varnish Co., 6th and Broadway, Kansas City, Mo. . . . . V P . .
Standard Flexible Comp. Co., 3607 Haverford Ave., Philadelphia, Pa. . . . . V P . .
Standard Insulation Co., Rutherford, N. J. . . . . V . . .
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. . . . . P . .
Standard Varnish Wks., 423 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa. . . . . V . . .
Toch Bros., 443 4th Ave., New York. . . . . V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. . . . . V . . .
2098. See Mitchell-Rand Mfg. Co.
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P . .
Vulcan-Lastite. See American Lastite Co.
Walker Co., Henry V., 17 John St., New York. L
Walpole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill. L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P . .
Zapon Co., Stamford, Conn. L
Zeilac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. L

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Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

PARAFFINE. See Wax and Compounds.

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Brown Paper Co., L. L., Adams, Mass.
Crocker-McElwain Co., Holyoke, Mass.
New York & Penn Co., 200 5th Ave., New York, N. Y.
Raquette River Paper Co., Potsdam, N. Y.
Reeve & Co., Angel H., 7 Spruce, New York, N. Y.
Rogers Paper Mfg. Co., So. Manchester, Conn.
Taylor-Logan Co., Holyoke, Mass.
Union Paper & Twine Co., 123 St. Clair Ave., N. W., Cleveland, O.
Warren Parchment Co., Dexter, N. Y.
Weber Co., F., 1220 Buttonwood, Philadelphia, Pa.
West Carrollton Parchment Co., West Carrollton, O.
Windsor Locks Paper Mills Co., Windsor Locks, Conn.

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Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Federal Insulating Corp., Yonkers, N. Y. (Also Wedges.)
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
White Supply Co., 4347 Duncan, St. Louis, Mo.

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Gilbert Supply Co., Independence, Iowa.
Little Speedster. See Gilbert Supply Co.
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Stylectric. See Post Electric Co.

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Asam Bros., 917 Arch, Philadelphia, Pa.
Asam Wright. See Asam Bros.
Capital Novelty Co., Lincoln, Neb.
Cummings Co., B. F., 4740 Ravenswood Park, Chicago, Ill.
Hamilton Engrs. Products Co., Hamilton, Ohio (Music Rolls).

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Anaconda. See American Brass Co.
Elephant Brand. See Phosphor-Bronze Smelting Co.
Gilby Wire Co., Riverside Ave., Newark, N. J.
Phosphor-Bronze Smelting Co., 2200 Washington Ave., Philadelphia, Pa.
Seovil Mfg. Co., Waterbury, Conn.

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Photion Elec. Corp., 400 E. 139th St., New York, N. Y.
Westinghouse Elec. & Mfg. Co., Mansfield, Ohio.

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Foote, Pierson & Co., 160 Duane, New York, N. Y.
Gray Co., 64½ W. Johnson, Philadelphia, Pa.
Holophane Glass Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Luxometer. See James G. Biddle.
Mathews. See Foote, Pierson & Co.
National Lamp Wks of G. E. Co., Cleveland, O.

PIGTAILS, Commutator. See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners.

PINIONS. See Gears and Pinions.

PINION PULLERS. See Pullers, Armature Shaft.

PLATES, Name. See Name Plates; Also Decalcomania.

PLATES. (Plate)
Fixture Outlet. See Fixture Fittings.
Storage Battery. See Plates, Storage Battery.

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Champion. See Englert Mfg. Co.
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C. & B. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., S. 25th and Jane Sts., Pittsburgh, Pa.
Esto. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
Link & Hemrick, Inc., 555 W. 52nd St., New York, N. Y.
New Jersey Storage Battery Co., 656 Summit Ave., Union City, N. J.
Universal Battery Co., 3410 S. La Salle, Chicago, Ill.
Witherbee Storage Battery Co., 75 Columbus Ave., New York.

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Bogue Elec. Co., Chas. J., 132 King, New York, N. Y.
Burke Elec. Co., Erie, Pa.
Chandeysson Elec. Co., St. Louis, Mo.
Connecticut Dynamo Motor Co., Irvington, N. J.
Conpro. See Eager Elec. Co.
Eager Electric Co., Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Specialty Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.

Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
Ideal Elec. & Mfg. Co., Mansfield, O.
Jantz & Leist Elec. Co., Cincinnati, O.
Kendrick & Davis Co., Lebanon, N. H.
L'Hommedieu & Sons Co., Chas. F., 4521 Ogden Ave, Chicago Ill.
Optimus. See Hanson-Van Winkle & Munning Co.
Pan. See Chandeysson Elec. Co.
Reliance. See L'Hommedieu & Sons Co., Chas. F.
Roth Bros. & Co., Chicago, Ill.
Westinghouse Elec. Mfg. Co., East Pittsburgh, Pa.

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Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Harpers Bros., 18 Crawford, Newark, N. J.
R. & H. Platinum Works, 709 Sixth Ave., New York.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal.
Wilson Co., H. A., Newark, N. J.

PLUG FUSES. See Fuses and Fuse Wire.
PLUG RECEPTACLES. See Receptacles, Plug.
PLUGS, Flashing. See Flashers, Sign.
PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment

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Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Anselite Elec. Mfg. Co., New Haven, Conn.
Anylite Elec. Co., Fort Wayne, Ind.
Arrow Elec. Co., Hartford, Conn.
Arro-Grip. See Arrow Elec. Co.
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Bryant Elec. Co., 1421 State, Bridgeport,
C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.
Cemco. See Connecticut Elec. Mfg. Co.
Cetelite. See Connecticut Moulded Products Corp.
Circle F Mfg. Co., Trenton, N. J.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Moulded Products Corp., Meriden, Conn.
Consolidated Gas Iron Co., 32 Union Square, New York, N. Y.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
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Eastman Mfg. Co., Manitowoc, Wis.
Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.
Esler Elec. Mfg. Co., 802 S. Adams, Marion, Ind.
Felso Products Co., 124 S. Calvert, Baltimore, Md.
Gaynot Elec. Co., Inc., Stratford Ave., Bridgeport, Conn.
General Elec. Co., Bridgeport, Conn.
Gold Seal Elec. Co., 250 Park Ave., New York, N. Y.
Gripall. See Beaver Machine & Tool Co.
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Hart & Hegeman Mfg. Co., Hartford, Conn.
Heetach. See Marks Products Co.
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Hubbell, Inc., Harvey, Bridgeport, Conn.
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Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Jiffy. See Esler Elec. Mfg. Co.
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Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
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Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
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Reynolite Masterpiece. See Reynolds Spring Co.
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Wellmade Elec. Mfg. Co., Torrington, Conn.
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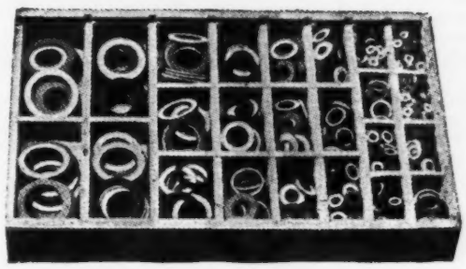

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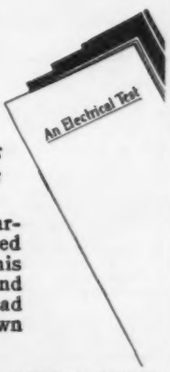

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INSULATION MANUFACTURERS CORP.
547 West Lake St., Chicago, Ill.

Points, Contact—Continued
Elkon Wks., Subsidiary of P. R. Mallory & Co., Portchester, N. Y.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Independent Contact Point Co., 545 39th, Union City, N. J.
Interstate Products Corp., 23 Commercial, Newark, N. J. (Platinum and Silver.)
King Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y. (Platinum.)
National Contact Co., 39 W. 60th, New York. (Platinum.)
Niehoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
R. & H. Platinum Works, 709 Sixth Ave., New York.
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.
POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
Refractory. See Cores, Resistance Coil.

PORCELAIN, Special Shapes
Akron Porcelain Co., Akron, Ohio.
American Porcelain Co., E. Liverpool, O.
A. P. See Akron Porcelain Co.
Burgess & Co., East Liverpool, O.
Carey Ohio Porcelain Co., Carey, O.
Central Porcelain Co., Columbiana, O.
Circle F Mfg. Co., Trenton, N. J.
Colonial Insulator Co., Akron, O.
Connecticut Porcelain Co., Trenton, N. J.
Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blac. See Star Porcelain Co.
Parker, J. H., 296 Broadway, New York, N. Y.
Pass & Seymour, Inc., Solvay Sts., Syracuse, N. Y.
Porcelava. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard Porcelain Co., Leetonia, O.
Standard & Specialty Porcelain Co., Sun Prairie, Wis.
Star Porcelain Co., Muirhead St., Trenton, N. J.
Summit Porcelain Co., Summit, N. J.
Thomas & Sons Co., R., East Liverpool, O.
Trenle Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.

POROUS CUPS
Unglazed earthenware cups for primary (wet) batteries.
Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding
Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip.)
Nutmeg. See Hart & Hegeman Co.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.
POTENTIOMETERS (Radio Control). See Radio Receiver Parts.
POWDERED CARBON. See Carbon, Powdered.
POWER TRANSMISSION CHAIN. See Chain, Power Transmission.
PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil
Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation
Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 330 N. Wales, Syracuse, N. Y.
Elmes Engrg. Works, Chas. F., 222 N. Morgan, Chicago, Ill.
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill.
Farquhar Co., A. B. York, Pa.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5834 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y.
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding
Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching
Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y.
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y.
Dunning & Boschert Press Co., 330 N. Wales, Syracuse, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 354 West 13th St., New York, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.

PRISMS, Chandelier. See Crystals, Chandelier.
PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft
Motor Pulley, Shaft & Pinion Pullers & Extractors.
Allen Electric & Equipment Co., Kalamazoo, Mich.
Crane Puller Co., Waltham, Mass.

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CONTACT points, of all things, must be absolutely reliable—so much depends upon their proper functioning. Long experience and extra care in manufacturing have made Baker Contact Points the safe, reliable units they are. They may be had of Platinum, Iridio-Platinum, Silver and special alloys. We shall be glad to send you detailed descriptions.

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54 Austin St. Newark, N. J.

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Premier Electric Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Weldenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

PULLEYS, Composition
Rockwood Mfg. Co., Indianapolis, Ind.
Spruceolite Co., Bloomfield, N. J.

PUMPS, Oil Burner
Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum
To Exhaust Incandescent Lamps.
Arrow Machine Co., 527 Hackensack Plank Rd., Union City, N. J.
Beach-Russ Co., 50 Church, New York, N. Y.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Bishop & Babcock Mfg. Co., 49th & Hamilton Sts., Cleveland.
Eimer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.
Worthington Pump & Machry. Corp., 115 Broadway, New York.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel
Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel
(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS
This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
Acme Appar. Co., 39 Osborne, Cambridge, Mass.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Airex Co., 799 Greenwich, New York, N. Y.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Elec. Co., 524 Westminster, Providence, R. I.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago.
All-Henry Coil Co., South Gale, Cal.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Alltone. See Miller, Inc., Bertrand F.
Ambassador Sales Co., 108 Greenwich, New York, N. Y.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Amsco Products, Inc., 416 Broome, New York. (TRF Kit.)
Anylite Electric Co., Fort Wayne, Ind.
Arbee Mfg. Co., 68 Springfield Ave., Newark, N. J.
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Armo Radio Laboratories, 1666 Tarleton, Los Angeles, Cal.
Arctic. See Premier Elec. Co.
Auburn Button Works, Auburn, N. Y.
Audioformer Transformer. See Pacent Electric Co.
Audiohm. See Electrad, Inc.
Balcon. See Pacent Electric Co.
Baldwin-Pacific Co., 640 Natoma, San Francisco.
B-Conomizer. See Pilot Elec. Mfg. Co.
Bee-Cee. See Brown & Cain.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bigve-Tuner. See Vogan, Frank C.
Birnbach Radio Co., 254 W. 31st, New York, N. Y.
Bodine Elec. Co., 2254 Ohio, Chicago, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Bremer-Tully Mfg. Co., 520 S. Canal, Chicago, Ill.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Brown & Cain, 2317 Calumet Ave., Chicago, Ill.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Bruno-Radio Corp., 40 Payntar Ave., Long Island City, N. Y.
Buffer. See Aerovox Wireless Corp.

PORCELAIN
Mercer Porcelain Co., Inc., Trenton, N. J.
SPECIAL SHAPES
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Buffalo. See DeJur Products Co.
Bypaciton Condenser. See Kapaciton Co.
Camfield Radio Mfg. Co., 807 Harrison, Oakland, Cal.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Elec. Mfg. Co.
Carco. See Carter Mfg. Co.
Caldwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Concertone. See Chicago-Jefferson Fuse.
Concourse Elec. Co., 286 E. 137th, New York, N. Y.
Condenser Corp. of America, 25 Waverly Pl., New York.
Connectoralds. See Alden Mfg. Co.
Consolidated Instrument Co. of America, 41 E. 42d, New York, N. Y.
Continental. See Gardiner & Hepburn, Inc.
Counterphase Kit. See Bremer-Tully Mfg. Co.
Crosradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crofot. See Premier Elec. Co.
Cycloid. See Duotone Radio Corp.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
Davidson Radio Corp., 134 Livingston, Brooklyn, N. Y.
Davohm. See Daven Corp.
DeForest Radio Co., Jersey City, N. J.
De Jur Products Co., 191 Lafayette, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 4377 Bronx Blvd., New York.
Duoformer. See Camfield Radio Mfg. Co.
Duopack. See Pacent Elec. Co.
Duratran. See Dubilier Condenser Corp.
Duray Radio Corp., 31 Clinton St., Newark, N. J.
Duotone Radio Corp., Wilmington, Del.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Eagle Mfg. Co., 72 York, Jersey City, N. J.
Eastern Elec. & Mfg. Co., Providence, R. I.
Eastern Specialty Co., 3551 N. 5th, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York
Elkay. See Langbein Kaufman Radio Co.
Elkon Wks., Subsidiary of P. R. Mallory & Co., Portchester, N. Y.
El Menco. See Electro Motive Engineering Co.
Emcotran. See Eagle Mfg. Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
Euphonic. See Bremer-Tully Mfg. Co.
Excelsion Radio Corp., 222 Grand, Brooklyn, N. Y.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Farapak. See Globe Art Mfg. Co
Fast Co., John E., Crawford & Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Feri Radio Mfg. Co., 1167 Bedford Ave., Brooklyn, N. Y.
Fett & Kimmel Co., Bluffton, O.
Filatrol. See Amsco Products, Inc.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Freesburg Co., George A., Elgin, Ill.
Frost, Inc., Herbert H., Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 900 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Glastor. See Daven Corp.
Globe Art Mfg. Co., 67 Winthrop, Newark, N. J.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Goyer Co., Willimantic, Conn.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Grid-Denser. See Amplex Instrument Co.
Gresser Sons Co., B., Sudbury, Boston, Mass.
Halldorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hammarlund-Roberts, 1182 Broadway, New York. (Kit.)
Hargraves, C. E. & H. T., Lakewood, R. I.
Harkness Radio Corp., Kenneth, 727 Frelinghuysen Ave., Newark, N. J. (Reflex Kits.)
Harmonik. See Karas Elec. Co.
Hart & Hegeman Mfg. Co., Hartford, Conn. (TRF Kits)
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Henry-Lyford. See University Radio Mfg. Corp.
Hex-Coil. See Eastern Elec. & Mfg. Co.
Hi-Ohm. See Carter Radio Co.
Hi-Pet. See Carter Radio Co.
Hi-Q Kit. See Hammarlund.
Held-Tite. See Carter Radio Co.
Hole-in-One. See Ambassador Sales Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Imieg. See Lynch, Arthur H.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co., 2 S. 20th, Philadelphia, Pa.
Isodon. See Auburn Button Works.
Isograd, Isoleak. See Pilot Elec. Mfg. Co.
Jaeger-Carlson Mfg. Co., 161 Jamaica Ave., Brooklyn, N. Y.
Kapaciton Co., 26 Elliott Place, Jersey City, N. J.
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kilograd. See Pilot Elec. Mfg. Co.
King Cole. See Anylite Electric Co.
Krohlack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
La Peer Elec. Mfg. Co., 326 W. Madison, Chicago, Ill.
Lavite. See Aerovox Wireless Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Leakandenser. See Daven Corp.
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnis. See General Winding Co.
Lind Radio Mfg. Corp., 70 Wyckoff Ave., Brooklyn, N. Y.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lo Wave. See Baldwin-Pacific Co.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Madison-Moore Radio Corp., 2524 Federal Blvd., Denver, Colo.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Mester Radio Instrument Co., 153 Wright, Newark, N. J.
Maxitran. See Electrical Research Laboratories.
Mazda Radio Mfg. Co., 3405 Perkins Ave., Cleveland, O.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
McCorkle Ensign Co., Elmira, N. Y.

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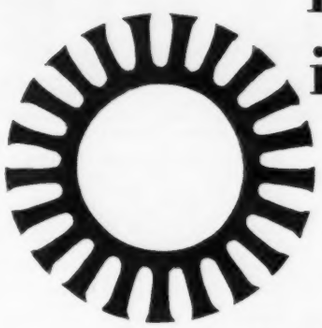

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Megestat. See Pacent Elec. Co.
Melco-Supreme. See Amsco Products, Inc.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metraligh. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., Flushing & Porter Aves., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Micro-Coupler Coil. See Simplex Radio Devices, Inc.
Micrograd. See Pilot Elec. Mfg. Co.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Millimeter Machine Works, Inc., 542 W. 22nd, New York.
Modern Electric Mfg. Co., Toledo, O.
Morris Register Co., Council Bluffs, Iowa.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 76th St. and Greenwood Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Nelsilde Condenser. See Nelson Tool Co.
Nelson Tool Co., 781 E. 142nd, New York, N. Y.
Neutro-Grad. See Pilot Elec. Mfg. Co.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohmite Mfg. Co., 210 W. Ontario, Chicago, Ill. (Resistance).
One Spot. See Madison-Moore Radio Corp.
One Way. See Carter Radio Co.
Orthometric. See Karas Elec. Co.
Orthophone. See Amsco Products, Inc.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol. See Wireless Radio Corp.
Parkin Mfg. Co., San Rafael, Calif.
Peerless Radio Products Co., 10844 Ashbury Rd., Cleveland, O.
Pence & Son, H. O., San Luis Obispo, Cal.
Pennsylvania Radio Laboratories, 37th & Brandywine, Philadelphia, Pa.
Perry Wire Works, 280 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Piander. See DeJur Products Co.
Pierce Airo. See United Scientific Laboratories.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Elec. Mfg. Co.
Potter Mfr Co., Waukegan, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
Powerohms. See International Resistance Co.
Powrad, Inc., 486 Johnson Ave., Brooklyn, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Precision Coil Co., 209 Centre, New York, N. Y.
Premier Elec Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Protectoraid. See Alden Mfg. Co.
Proudfoot. See Cruver Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radio File. See Pacent Elec. Co.
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Products Co., Westport, Conn.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Receptor Co.
Recesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Elec. Mfg. Co.
Rex Laboratories, Inc., 341 Superior Arcade, Cleveland, O.
R. G. S. Sales Co., 54 Greenleaf Ave., West Brighton, N. Y. (Kit.)
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Rosenbloom Co., Wm., 11 Deering Rd. (Mattapan), Boston, Mass. (Super-Heterodyne Kits.)
R. U. F. Products Co., 319 Glenmore Ave., Brooklyn, N. Y.
St. James Laboratories, 845 W. Washington, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Sangamo Elec. Companies, Springfield, Ill.
Scanlan Elec. Mfg. Co., 1113 N. Franklin, Chicago, Ill. (Output Transformers.)
Scheib & Sons, J. F., 6243 Station, Pittsburgh, Pa.
Scott Sales Co., 439 S. San Pedro, Los Angeles, Cal.
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Serlson Magneto Engr. Co., 538 Fernwood Ave., Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.
Signal Elec. Mfg. Co., Menominee, Mich.
Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
Simplex Radio Co., Main & Rector Sts., Philadelphia, Pa.
Simplex Radio Devices, Inc., 231 Mulberry, Newark, N. J.
S. L. R. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Sonatron Tube Co., Chicago, Ill. (Resistance Coupled Amplifier).
Spencer Mfg. Co., Aurora, Neb.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dent. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stokes & Smith, (Summerdale) Philadelphia, Pa.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Strand Elecl. Apparatus, Malden, Mass.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Syncrodenser. See Precise Mfg. Corp.
Tandem. See Bremer-Tully Mfg. Co.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago, Ill.
Thorola. See Reichman Co.
Tobe Deutschman Co., Cambridge, Mass.
Tone Control. See Sprague Specialties Co.
Toreid. See All American Mohawk Corp.
Torostyle. See Bremer-Tully Mfg. Co.
Transcontinental Coil & Winding Co., 5 Kirk Place, Newark, N. J.
Transcript-Clapp Kit. See Samson Electric Co.

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Cable markers, terminal lugs, tube contacts, eyelets, rivets, screws, angles, brackets — everything in radio hardware.
Expert electrical stamping, send blueprint or samples.
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Truphonic Amplification. See Alden Mfg. Co.
Tun-A-Far Coil. See Waage Elec. Co.
Tune Rite. See Radiall Co.
Turn-It Radio Sales, 71 Murray, New York, N. Y.
Tuway. See Carter Radio Corp.
Twin-aud. See Peerless Radio Co.
Twin Coupler Co., Poughkeepsie, N. Y.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Tyrman Elec. Corp. 143 W. Austin Ave., Chicago, Ill.
Ultimax. See Pacent Elec. Co.
Ultra Varlo. See Bruno Radio Corp.
Uncle Sam Electric Corp., Plainfield, N. J.
Univernier Condenser. See Auburn Button Works.
Universal Winding Co., Boston, Mass.
University Radio Mfg. Co., 50 Park Place, New York, N. Y.
U. S. Tool Co., Ampere, N. J.
Variall Condenser. See Muter Co.
Veeko. See Carter Mfg. Co.
Verni-Juster. See Brooklyn Metal Stamping Corp.
Victory. See Carter Mfg. Co.
Viking Tool & Machine Co. 745 65th, Brooklyn, N. Y.
Vogan, Frank C., 1213 Race, Philadelphia, Pa.
Waage, A. H., 112 Chambers, New York, N. Y.
Waterbury Button Co., Waterbury, Conn.
Web. See Bathgate Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windham. See Goyer Co., Willimantic, Conn.
Wireo Kit. See Rosenbloom Co., Wm.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.
Wizard Condenser Co., Jamaica Plain, Boston, Mass.
Workrite. See Zinke Co.
X-L Radio Laboratories, 2424 Lincoln Ave., Chicago, Ill.
Yorktown Radio Corp., 122 Cypress Ave., New York, N. Y.

RADIO HARDWARE. See Radio Mountings.

RADIO MOLDED PARTS

Panels, Dials, Knobs, Tube Bases, etc., of Hard Rubber, Composition, Fibre, Glass and other non-metallics. For Metal Panels and Dials see Radio Mountings.

Accuratune Panel. See Mydar Radio Co.
Ace. See American Hard Rubber Co.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
American Lava Corp., 1425 William, Chattanooga, Tenn.
Aristocrat. See Furz-Kasch Co.
Auburn Button Works, Auburn, N. Y.
Bell Mfg. Co., 11 Elkins, Boston, Mass.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Celasta Rubber Co., 68 South, Boston, Mass.
Celoron Co., Bridgeport, Pa.
Century Radio Panel Co., 26 Barclay, New York, N. Y
Dialler. See Loughman, W. F.
Dialog. See Elebeth Co.
Diamond State Fibre Co., Bridgeport, Pa.
Du Pont de Nemours & Co., Wilmington, Del.
Eisler Engrg. Co., 770 S. 13th, Newark, N. J. (Bases)
E-Z-Tone Radio Co., Fortville, Ind.
Federal Insulating Corp., Yonkers, N. Y.
Forest City Rubber Co., 1276 Ontario, Cleveland, Ohio.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati.
Gilligan Glass Products Co., New Philadelphia, O. (Bases.)
Goodrich Rubber Co., B. F., Akron, Ohio.
Hi-Heet. See Insulation Mfg. Co.
Hood Rubber Co., Watertown, Mass.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
Hub Radio Panel Co., 434 Harrison Ave., Boston. (Panels.)
Insulate. See Insulation Mfg. Co.
Insulation Mfg. Co., New York Ave. & Herkimer St., Brooklyn, N. Y.
International Insulating Corp., Elyria, Ohio.
Karolith Corp., 189-13th St., Long Island City, N. Y. (Panels).
Kurz-Kasch Co., Dayton, Ohio.
Looksee. See Loughman, W. F.
Loughman, W. F., 161 High, Boston, Mass. (Dials.)
Mahoganite. See American Hard Rubber Co.
Micarta Fabricators, Inc., 300 Canal, New York. (Panels.)
Micarta Panel. See Westinghouse Elec. & Mfg. Co.
New England Products Co., 232 Greenwich, New York, N. Y.
New York Hard Rubber Turning Co., 212 Centre, New York.
Pyradiolin Panel. See Du Pont de Nemours & Co.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., (Irvington) Newark, N. J.
Spaulding Fibre Co., Tonawanda, N. Y. (Panels.)
United States Rubber Co., 1790 Broadway, New York, N. Y.
Veri-Chromed. See Formica Insulation Co.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y.
Waterbury Button Co., Waterbury, Conn.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

RADIO MOUNTINGS

Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels, etc.

Airex Co., 799 Greenwich, New York, N. Y.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Springfield, Mass.
American Radio Hardware Co., 135 Grand, New York.
Bonza. See Haydon & Haydon.
Brarston Co., Inc., Chas. A., 297 Washington, Buffalo.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill. (Metal Panels.)
Dejur Products Co., 191 Lafayette, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Etchart Panel. See Grammes & Sons.
Eureka. See Morse Co., Frank W.
Firth Radio Co., 25 Beaver, New York, N. Y.
Glodial. See Wireless Radio Corp.
Grammes & Sons, L. F., Allentown, Pa. (Metal Panels.)
Gray & Danielson Co., Remler Div., 260 First, San Francisco.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa.
Kelbrackets. See Kelleradio, Inc.
Kelleradio, Inc., 821 Market, San Francisco, Cal.
Lynch, Arthur H., Fisk Bldg., B'way and 57th, New York.
Micamould Radio Corp., Flushing & Porter Aves., Brooklyn.
Monosmith Bros. Co., Spencer, Ohio. (Metal Dials.)
Morse Co., Frank W., 289 Congress, Boston, Mass.
Mucher, John J., 109 Lafayette, New York, N. Y.
Muter Co., Leslie F., 76th and Greenwood Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Palmer & Palmer, 404 W. Utica, Buffalo, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Remler. See Gray & Danielson Co.
Saturn Mfg. & Sales Co., 48 Beekman, New York, N. Y.
Schwartz & Son, Maurice, 710 Broadway, Schenectady, N. Y. (Detectors.)
United Radio Mfg. Corp., 191 Greenwich, New York.
Van Doorn Co., 160 N. LaSalle, Chicago, Ill. (Metal Panels.)
Vee Dee. See Van Doorn Co.
Visco Dial. See Monosmith Bros. Co.
Willis Smith & Inst. Co., 8 Kingsbury, Jamestown, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.

Acast. See United Radio Corp.
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
American Mechanical Laboratories, Inc., 285 N. Sixth, Brooklyn, N. Y.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Amsco Products, Inc., 416 Broome, New York, N. Y.
Aurora Electric Co., 14 Dunham Pl., Brooklyn, N. Y.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
Autostat. See Kodel Radio Corp.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Machine & Tool Co., Dept. M4, 625 N. Third, Newark, N. J. (Multiple Plugs).
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Bruno Radio Corp., 40 Payntar Ave., Long Island City.
Cabelug. See Jones, Howard B.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Also Socket Adapters.)
Champion. See Automotive Equipment Co.
Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
Centralab. See Central Radio Laboratories.
Clarostat. See American Mechanical Laboratories.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
Dejur Products Co., 191 Lafayette, New York, N. Y.
De Veau. See Stanley & Patterson.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See Amsco Products Co.
E-Z. See Polymet Mfg. Corp.
Duray Radio Corp., 31 Clinton St., Newark, N. J.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Forest City Rubber Co., 1276 Ontario, Cleveland, Ohio.
Frost, Herbert H., Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 477 Broadway, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Heinemann Elec. Co., Philadelphia, Pa.
Imp. See Carter Radio Co.
Jones, Howard B., 2226 Wabansia, Chicago, (Multiple Plug).
Klesner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Mazda Radio Mfg. Co., 3405 Perkins Ave., Cleveland, O.
Millimeter Machine Works, 542 W. 22nd St., New York.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 289 Congress, Boston, Mass.
Murdock Co., Wm. J., Chelsea, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago.
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Engineering Co., 16 Union Ave., New Rochelle, N. Y.
Royalty. See Electrad, Inc.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 130 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Tip Top. See Eby Mfg. Co.
Tubestat. See Muter Co.
Union Radio Corp., 124 Sussex Ave., Newark, N. J.
United Radio Corp., 15 Caledonia Ave., Rochester, N. Y.
United Radio Mfg. Corp., 191 Greenwich, New York, N. Y.
Urmea. See United Radio Mfg. Corp.
Westerland Corp., Dobbs Ferry, N. Y.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Elec. & Mfg. Co., 351 Halsey, Newark, N. J.
Cable Supply Co., 31 Union Square, New York, N. Y.
C. E. Mfg. Co., 702 Eddy, Providence, R. I.
Cleartron Vacuum Tube Co., 28 W. 44th, New York, N. Y.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
Daven Radio Corp., 158 Summit Ave., Newark, N. J.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago.
Gold Seal Electrical Co., 250 Park Ave., New York, N. Y.
Manhattan Elecl. Supply Co., 17 Park Pl., New York, N. Y.
Northern Mfg. Co., 365 Orden, Newark, N. J.
Perryman Electric Co., 33 W. 60th, New York, N. Y.
Q R S Music Co., 306 S. Wabash Ave., Chicago, Ill.
Radio Corp. of America, 233 Broadway, New York.
Raytheon Mfg. Co., Kendall Square Bldg., Cambridge, Mass.
Schickerling Products Corp., 401 Mulberry, Newark, N. J.
Sonatron Tube Co., Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 588 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave., Irvington, N. J.

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For

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These motors are used to close a switch or series of switches. They are often opened by counter weights, although the motor may be readily reversed electrically.

Unfailing rotation is so essential in this type of service that ball bearings are used. Rotation is thus assured, even though oiling may be neglected.

Ohio Torque Motors are very quiet, positive in action and uniform.

Made for Various Types of Service

100% Locked Service: For services where the motor may be locked across the line for several hours at a time; in fact, this type may remain locked across the line for 24 hours without injury to the motor.

50% Locked Service: For services where the motor is locked across the line approximately 50% of the time; that is, say, 30 seconds on and 30 seconds off. This type of motor may remain locked across the line for one hour without injury to the motor.

25% Locked Service: For services where the motor is locked across the line 25% of the time; that is, say, 15 seconds on and 45 seconds off. This type may remain locked across the line for 20 minutes without injury to the motor.

10% Locked Service: For services where the motor is locked across the line about 10% of the time; that is to say, 6 seconds on and 54 seconds off. This type may be left locked across the line for 10 minutes without injury to the motor.

Ohio Torque Motors are available in sizes of 3 to 64 ounce feet Torque. Complete details and dimensions are available on request.

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5905 Maurice Ave., Cleveland, Ohio

Also manufacturers of a complete line of
Standard A.C. and D.C. Motors

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RADIO TUBE BASES. See Radio Molded Parts.
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Special wiring cable and harness assemblies for radio battery connections, radio tube adapter harness for converting battery operated receivers to A.C. operation; Socket Adapters for Power Tubes; Loud Speaker Extension Cords—This heading also includes auto ignition assemblies.
Afco. See American Fabric Co.
Alden Mfg. Co., Springfield, Mass. (Adapters.)
Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
American Wireless Corp., 33 W. 17th St., New York, N. Y.
Arcturus Radio Co., 255 Sherman Ave., Newark, N. J. (Adapters.)
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 34th St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Adapters.)
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa (Adapters).
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., Elkhart, Ind. (Adapters).
Gossard Radio & Wire Co., Belvidere, Ill.
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Morse Co., Frank W., Boston, Mass.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Riga. See Birnbach Radio Co.
R. U. F. Products Co., 319 Glenmore Ave., Brooklyn, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Electric Mfg. Co., 52 Orawaupum St., White Plains, N. Y.

RADIUM POWDER AND PAINT

Radium Dial Co., Forbes and Meyran Ave., Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 30 Church, New York, N. Y.
RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.
RAWHIDE GEARS. See Gears & Pinions, Composition.
READING LAMP BASES. See Bases, Reading Lamp.
REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

	KEY
Battery Charging	See B
Floor Boxes	See F
Welding	See W
Machine Tool	See W
Watertight, Marine, Mine	See M
Car Trailer Connection	See C
Extension	See E

A. B. C. See Anderson Mfg. Co.						
Adam Electric Co., Frank, St. Louis, Mo.	F					
Adapti Co., 2996 E. 72nd, Cleveland, O.	F					
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.		B	W	M	C	E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.				M		
Arktite. See Crouse-Hinds Co.						
Arnessen Electric Co., 13 Water, New York				M		
Arrow Elec. Co., Hartford, Conn.		F	B	W		
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y.						E
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.	F		W	M		
Bryant Elec. Co., 1421 State, Bridgeport, Conn. (Also Range Type)			W			
Campbell. See Steel City Elec. Co.						
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal.	F					
C. E. M. Co. See Conn. Elec. Mfg. Co.						
C. H. See Cutler-Hammer Mfg. Co.						
Circle F Mfg. Co., Trenton, N. J.				M		
Conduletto. See Crouse-Hinds Co.						
Connecticut Elec. Mfg. Co., Bridgeport, Conn.	F					
Cory & Son, Chas., 183 Varick, New York				M		
Crouse-Hinds Co., Syracuse, N. Y.		B	W			
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.	F					
Delta-Star Elec. Co., 2433 Fulton, Chicago			W	M		
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.		B				
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.						C
Elwell Parker Elec. Co., 4222 St. Clair Ave., N. E., Cleveland, O.		B				
Fielding. See Stanley & Patterson.						
Fountain's. See Jenkins Mfg. Co.						
Fullman Mfg. Co., Latrobe, Pa.	F					
Fullman. See Steel City Elec. Co.						
Gleason & Co., J. L., 241 Franklin, Boston, Mass.						E
General Elec. Co., Bridgeport, Conn.		B				
H. & H. See Hart & Hegeman Mfg. Co.						
Hart & Hegeman Mfg. Co., Hartford, Conn.		B	W			
Hessel Co., W. F., 76 Greenwich, New York, N. Y.			W	M		E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.)		B	W			
Indestructible. See Kliegl Bros. Universal.						
Jenkins Mfg. Co., Bloomfield, N. J.						E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y.	F	B	W	M		
Latrobe. See Fullman Mfg. Co.						
Major Equipment Co., 4608 Fullerton Ave., Chicago, Ill.				M		
Loeffelholz & Co., Milwaukee, Wis.					C	
NePage McKenny Co., Armour Bldg., Seattle, Wash.	F					
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa.					C	
Ohio Elec. & Controller Co., 5904 Maurice Ave., Cleveland, Ohio			W			
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.						
Preset. See Walker Bros. Co.						

Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.			W	M	C	E
Quadrangle Mfg. Co., 30 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)						
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill.						
Russell & Stoll Co., 53 Rose, New York	F	B	W	M		E
Square D. Co., 6060 Rievard Ave., Detroit, Mich.			W			
Stanley & Patterson, 150 Varick, New York, N. Y.	F					
Steel City Elec. Co., Pittsburgh, Pa.	F					E
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.				M		
Walker Bros., 1417 Sansom, Philadelphia	F					E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	F	B	W	M		
Yale. See Electric Products Co.						

RECORDERS, Elapsed Time. See Indicators, Operation.
REDUCERS, Socket. See Socket Reducers.
REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

ABolite Reflector Co., 7500 Sherman Ave., Cleveland, O.
Benjamin Elec. Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Cello, Inc., 19 W. Houston, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Marbelite Products Co., 140 N. Robey, Chicago, Ill.
Maxolite. See Ralco Mfg. Co.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 30 S. Peoria, Chicago, Ill.
Ralco Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.

REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska. Refrigerator Co., Muskegon, Mich.
Allen Filter Co., 25 S. St. Clair, Toledo, O. (Water Cooler Unit.)
American Refrigerator Corp., Peru, Ind.
Argus Products Co., 174 E. Water, Portland, Ore.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Automatic. See Illinois Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall ElectrICE Corp., Belding, Mich.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Boyer Refrigerator Co., 2217 Locust, St. Louis, Mo.
Cameo Refrigerator Corp., 673 N. Main, Los Angeles, Cal.
Castle Double-Servis. See Home Products Corp.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 131 E. 34th, New York, N. Y.
Cold Storage Refrigerator Co., Eau Claire, Wis.
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dillingham Mfg. Co., Sheboygan, Wis.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gruendler Mfg. Co., Gustav J., 814 N. Broadway, St. Louis.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 133 W. Washington, Chicago, Ill. (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Co., Euclid Ave. at 65th, Cleveland, O.
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Home Products Corp., Jackson, Mich.
Howe Scale Co., Rutland, Vt.
Iceless Cooler Corp., 225 N. Michigan Ave., Chicago, Ill. (Ice Cream Cabinets.)
Illinois Refrigerator Co., Morrison, Ill.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Hershey Bldg., Pittsburgh, Pa.
Knox. See Erie Art Metal Co.
La Crosse Refrigerator Corp., La Crosse, Wis.
Leonard Refrigerator Co., Div. of Electric Refrigerator Co., Grand Rapids, Mich.
Ligonier Refrigerator Co., Ligonier, Ind.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Lorraine. See La Crosse Refrigerator Corp.
Louisville Refrigerator Co., 660 Shore Drive, Chicago, Ill.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2664 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.
Northey Mfg. Co., Waterloo, Iowa.
Omaha Fixture & Supply Co., 11th and Douglas, Omaha
Oreole. See Ottenheimer Bros.
Ottenheimer Bros., Baltimore, Md.
Ranney Refrigerator Co., Greenville, Mich.
Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
Revolvo. See Iceless Cooler Corp.
Rex Mfg. Co., Connersville, Ind.
Rexdale See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Saco-Lowell Shops, Newton Upper Falls, Mass.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.

Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal.
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.

RELAYS

(See also Circuit Breakers and Thermostats.)
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
Dunco. See Dunn, J. Struthers.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Wilcolator Co., 17 Nevada, Newark, N. J.
REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil

Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE

Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio. See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS. See Units, Rods & Grids.
REVOLUTION COUNTERS. See Tachometers.

RHEOSTATS

Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

	F	B	D	P	M	L
Allen-Bradley Co., 493 Clinton, Milwaukee						L
Biddle, James G., 1211 Arch, Philadelphia						L
Boice, W. B. & J. E., 1730 Norwood Ave., Toledo, O.						L
Brach Mfg. Co., Newark, N. J. (Radio Battery Control.)		B				
Bradleystat. See Allen-Bradley Co.						
Carter Mfg. Co., 6300 Euclid Bldg., Cleveland, O.	F					
Controlite. See Ward Leonard Elec. Co.						
Crown Rheostat & Supply Co., 1910 Park Ave., West Chicago, Ill.				P		
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.	F	B	D			L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa.	F					
Electric Controller & Mfg. Co., 79th and Woodland Ave., S. Cleveland, O.	F					
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O.		B				
General Electric Co., Schenectady, N. Y.	F					
Holzmuller, C. J., 1108 Howard, San Francisco, Cal.			D			
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y.			D		M	
Knoeller Elec. Co., De Pere, Wis.	F					
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago	F	B	D		M	L
Robertson, Leo F., 536 W. 22nd, New York, N. Y.					M	
Schaefer Bros. Co., 1059 W. 11th, Chicago		B				
Simplicity. See Cutler-Hammer Mfg. Co.						
Union Elec. Mfg. Co., Milwaukee, Wis.	F					
Universal. See Ward Leonard Elec. Co.						
Valley Electric Co., 4515 Shaw Ave., St. Louis, Mo.		B				
Victoreen. See Carter Mfg. Co.						
Vitrohm. See Ward Leonard Elec. Co.						
Ward Leonard Elec. Co., Mt. Vernon, N. Y.	F		D		M	
Watton. See Electric Products Co.						
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.	F				M	

RINGS Seal. See Packing.

RIVETS

Chicago Rivet & Specialty Co., 1830 S. 54th, Chicago, Ill.
Hassall, Inc., John, Clay & Oakland Sts., Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Merwin Mfg. Co., Bridgeport, Conn. (Solid & Tubular).
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Wright & Corson Mfg. Co., Bridgeport, Conn.
RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening

Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.

RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard

Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Murhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Co., Enterprise Ave., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco. See Vulcanized Rubber Co.

RUBBER, Sponge

Toycraft Rubber Co., Ashland, O.
RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines.

SCRAPERS, Wire

Acme. See A. Laubscher.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Austin Co., M. B., 168 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.

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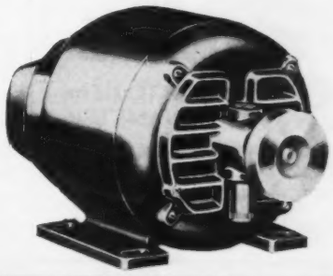

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Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW MACHINE PRODUCTS

Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
Blake & Johnson Co., Waterbury, Conn.
Celoron Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Clark Metal Products, Inc., 490 Hanecek Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.
Faries Mfg. Co., Decatur, Ill.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis, Ind.
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Steinen & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)

Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive

Parker-Kalon Corp., 190 Varick, New York, N. Y.

SCREWS, Machine

Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)

American Screw Co., Providence, R. I.
SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery

Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carlisle & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Ferry Mfg. Co., St. Louis, Mo.
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 585 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES

Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric

Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 555 W. Madison, Chicago. (Silk.)
Adelphi Lamp Shade Co., 306 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Aladdin Mfg. Co., Sales Div. No. 802, Muncie, Ind.
Andrews Co., C. M., 33 E. 30th, New York, N. Y. (Silk.)
Artistic Lamp Shade Co., 848 Milwaukee Ave., Chicago.
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatchford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th, New York. (Silk, Linen.)
Borghese. See Hall, Chas.
Cohan Co., Laigh M., 205 S. Ninth, Philadelphia, Pa. (Silk.)
Dalger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chintz.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kelton Mfg. Co., Worcester, Mass. (Silk.)
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Max-Ray. See Maxwell Ray Co.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Miller Co., Meriden, Conn. (Silk, Parchment.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Noe & Sons, Wm. R., New York, N. Y. (Silks)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Franklin Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)
Rindsberger Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
San Dor. See Ryan, Mary
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Storrs Mica Co., 11 Park Place, New York, N. Y.
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tapestrelle Corp., 44 E. 29th, New York, N. Y.
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.

SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 223 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 101 Park Ave., New York, N. Y.
Bent Glass Novelty Co., 54 W. Third, New York, N. Y.
Handel Co., Meriden, Conn.
Mosaic Shade Co., 589 E. Illinois, Chicago, Ill.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Novelty Lighting Corp., 2488 E. 22nd, Cleveland, O.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Standard Elec. & Mfg. Co., Cedar Rapids, Ia.
Tiffany Studios, 391 Madison Ave., New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.
SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Faries Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 230 10th Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Standard Elec. Supply Co., 223 N. 13th, Philadelphia, Pa.
Western Reflector Co., 1291 W. Madison, Chicago (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.
SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil

Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

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SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Patton-MacGuyer Co., Providence, R. I.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)
Waterbury Mfg. Co., Waterbury, Conn.
SHUNTS, Instruments. See Instruments, Laboratory Standard.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."
SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., Newark, N. J.
SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE

For Switchboard Slabs and Barriers.
Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Munson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.
SLEEVE-BEARINGS. See Bearings and Bushings.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hulhorst Micro Tool Co., 3242 E. Monroe, Toledo, Ohio.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1262 W. Fourth, Cleveland, Ohio.
Onan, David W., 34 Royalston Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio.
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
SNAP SWITCHES. See Switches, Snap

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Lin-Stun. See Westinghouse.
Soapstone Products Co., 97 Warren, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
SOCKET LININGS. See Linings, Socket
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain and Attachments

Pull Chain, Chain Links, Chain Adjusters, Acorns, Extensions, Insulation Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
American Brass Co., 25 Broadway, New York, N. Y. (Acorns.)
Arrow Electric Co., Hartford, Conn.
Auburn Elec. Co., Butler, Ind.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Bryant Electric Co., 1421 State, Bridgeport, Conn.
Dunlex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Harrigan, T. M., Woodstock, Vt. (Links.)
Hart & Hegeman Mfg. Co., Hartford, Conn. Metal Pull Tassel.

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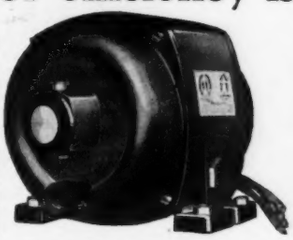

. . . assuring you of maximum service through long years of operation.

The best materials and workmanship are incorporated in the B-LINE MOTORS. They will help sustain the reputation of your appliances.

Guaranteed to satisfy you.
Sizes ⅛ to 3 H.P.

The Brown-Brockmeyer Co., Inc.
Dayton, Ohio

★NATIONAL★

RHEOSTATS

UNEQUALED: BUT COST NO MORE

Adjustable Resistance At Its Best

SMALL IN SIZE
LIGHT IN WEIGHT
HIGH IN QUALITY
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FINE CONTROL

MOTOR SPEED CONTROLLERS
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Universal Motor for 110 Volts

Suitable for phonograph drives, drink mixers, sewing machines, small Lathes, etc.

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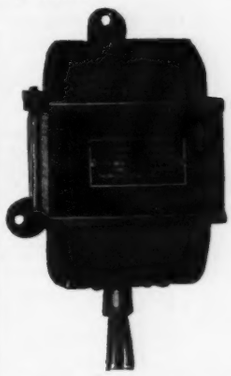
Offices in all Principal Cities

Standard-Special Explosion Proof For all Purposes A.C.-D.C.

Is Your Equipment Adaptable to ANY Electrical Circuit?

Perhaps you, like other manufacturers of electrically operated equipment, would find it more desirable, for economical or safer operation, to supply your equipment for one or more standard circuits or for a special current.



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provide a practical, economical and convenient means of changing the characteristics of odd or objectionable alternating current circuits to better fit your equipment.

They are compact, all self-contained in a single unit—readily portable or can be permanently installed.

Made in sizes ½ to 50 K.V.A., inclusive. Single Phase, Two Phase and Three Phase.

Having no oil, they can be used inside of buildings and Meet all Code requirements.

Tell us your problems and we will make recommendations and submit data without obligation.

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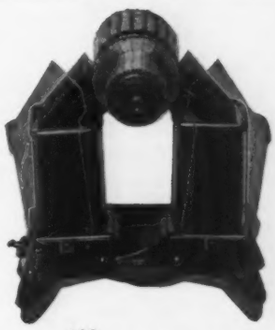
89 W. Water Street Milwaukee, Wis.

IDEAL adjustable portable Growler



—a tool that will test any armature from ¾″ to 10″ in diameter.

"IDEAL" Growlers make the proper span, eliminating the troublesome core or slot shorts. Can be used with any standard meter or lamp test; or, as a magnet charger when used with batteries. Complete with 6 foot cord, switch and plug.

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Electrical Repair Shop Equipment
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Without obligation, please send me your price list and complete information about your Ideal Adjustable Growler and Ideal Mica Undercutter and stand.

Socket Chains, etc.—Continued
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 30 Shipman, Newark, N. J. Links, Insulators.

SOCKET REDUCERS

Arrow Elec. Co., Hartford, Conn.
Benjamin Electric Mfg. Co., 120 S. Sangamon, Chicago, Ill.
Can-del-ite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Schenectady, N. Y.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Morse Co., Frank W., 289 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co. M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 50 Boylston, Boston, Mass.

SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key ..... See K.
Composition ..... See W
Metal Shell ..... See B
Porcelain ..... See A
Pull Chain ..... See P
Push Through ..... See T
Sign Receptacles ..... See A

| | | |

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Saves labor—because accurately sized to fit cables and square-cut at open end. Saves solder—because cables fit snug. Saves electricity—because shape makes proper contact and copper is deoxidized. Saves trouble—because properly boxed and labelled. The prices will win your order.

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WESTON SERVICE
to the Electrical Manufacturer

THE name "Weston" on an electrical measuring instrument means to the scientist the highest quality obtainable in design and construction, as well as the most authentic reference in the precise measurement of electrical quantities.

To the electrical fraternity, Weston is the pioneer and progressive leader in the art of electrical measurement.

To the industrial and commercial enterprise, Weston stands for the greatest institution of its kind in the world, as well as headquarters for development service where new and unusual control operations suggest the application of electrical testing instruments.

To all of these Weston offers the most complete and dependable line of indicating instruments for every conceivable service.

Add to these considerations the important fact that Weston instruments represent the ***lowest cost*** testing equipment in the market based on reliability, upkeep and long-life accuracy.

Weston Panel Instruments of 2″ and 3¼″ Diameter

The smallest of all Weston models, but offering ideal features of electrical design and construction suitable for the widest application to industrial testing, are the miniature panel instruments of A.C., D.C. and Thermo-Couple types.

They serve the electrical manufacturer in a two-fold capacity: First—as thoroughly scientific instruments,—they provide absolutely reliable and inexpensive testing equipment for checking and assuring the quality of any electrical product during manufacture.

Secondly—as to the ***name-plate value*** of these beautifully handcrafted instruments, and by virtue of their highest trade standing in the world's markets,—their incorporation with a manufacturer's product as an integral part of its control equipment will substantially augment the prestige of the article.

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Weston Electrical Instrument Corporation
582 Frelinghuysen Ave., Newark, N. J.

Weston
PIONEERS SINCE 1888
INSTRUMENTS

2″ and 3¼″ Diameter Flush Type Panel Instruments made as A. C. and D. C. Voltmeters, Ammeters and Milliammeters. Also in Thermo-Couple Types.

STAMPED BOXES. See Cabinets, Sheet Steel.
STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

Heavy Stamping and Drawing.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
Beaver Machine & Tool Co., Dept. M4, 625 N. Third, Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
Beaver Machine & Tool Co., Dept. M4, 625 N. Third, Newark, N. J.
Bull Dog Electric Products Co., Detroit, Mich.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Faries Mfg. Co., Decatur, Ill.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. O., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Kelly Brass Wks., 226 W. Ontario, Chicago, Ill.
Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Niagara Metal Stamping Co., Niagara Falls, N. Y.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1724 N. Fifth, Philadelphia, Pa.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Reliance Die & Stamping Co., 501 N. La Salle, Chicago,
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 6 Howard, New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 34 Royalston Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).
STEATITE. See Cores, Resistance Coil.
STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances

Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet

Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelee. See Mansfield Sheet & Tin Plate Co.
Central Alloy Steel Corp., Massillon, O.
Dynelec. See Mansfield Sheet & Tin Plate Co.
Empire Steel Corp., Mansfield, O.
Manelec. See Mansfield Sheet & Tin Plate Co.
Metelec. See Mansfield Sheet & Tin Plate Co.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Mansfield Sheet & Tin Plate Co.
Tranelec. See Mansfield Sheet & Tin Plate Co.
Trumbull Steel Co., Warren, Ohio.
Wheeling Steel Corp., Wheeling, W. Va.

STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers

Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1039 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.
STORAGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.
STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL

Acme Steel Co., 2840 Archer Ave., Chicago, Ill.
SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.
SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.
SWITCH (Switches)
Arms. See Posts, Binding.

"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife. See Switches, Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor;
Mercury. See Switches, Mercury
Motor Starting. Magentic Type. See Controllers.
Motor Starting. Non-Magnetic Type. See Switches, Knife.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Toggle. See Switches, Snap.
Tumbler. See Switcehs, Snap.

SWITCHES, Battery and Baby Knife

Cut-Outs. Switches.
Anti-Wood. See Keil & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., 1421 State, Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2801 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Couch Co., S. H., Norfolk Downs, Mass.
Crown. See Edwards & Co., Inc.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jest. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-F Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Manhattan Elec'l Supply Co., 17 Park Pl., New York, N. Y.
Morse Co., Frank W., Boston, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago, Ill.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Puritan. See S. H. Couch & Co.
Reliable Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland.
Sta-Rite. See Frank W. Morse & Co.
Thordarson Elec. Mfg. Co., 500 W. Huron, Chicago.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Knife; Safety

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms. Mfg. Co.
Adam Elec. Co., Frank, St. Louis, Mo.
American Elec. Switch Corp., Minerva, O.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
Diamond C. See Standard Elec. Supply Co.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Hill. See Mendell Mfg. Co.
Large-Dail Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 3907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen, John W., 201 N. Los Angeles, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Mendell Elec. Mfg. Co., Mattapoisett, Mass.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Safuse. See Federal Steel Products Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
Square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Standard Elec. Supply Co., 223 N. 13, Philadelphia, Pa.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co., 144 Bleeker, Newark,
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegmann & Co., E. M., 3611 N. 11th, St. Louis.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Con-Tac-Tor. See Absolute Con-Tac-Tor Corp.
Cooper Hewitt Electric Co., 410 Eighth, Hoboken, N. J.
Cramblett Engineering Corp., 286 Milwaukee, Milwaukee.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Federal Gauge Co., 564 W. Adams, Chicago, Ill.
Hywatt. See Cramblett Engr. Co.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
M. D. Co. See Mechanical Devices Co.
Mechanical Devices Co., Aurora, Ill.
Mercoid. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer Mfg. Co., 1237 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Dunn, J. Struthers.
Dunn, J. Struthers, 1135 Race, Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Co., Milwaukee, Wis.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York.
South Bend Current Controller Co., South Bend, Ind.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

KEY
Feed Through ..... See p
Fixture (Canopy, Candelabra and Key Arm) ..... See F
Flush ..... See f
Lever, Toggle, Tumbler ..... See L
Pendant ..... See p
Push Button ..... See P
Rotary ..... See R
Surface ..... See s

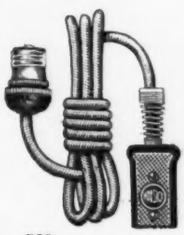
See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo.	f								
Anylite Elec. Co., Ft. Wayne, Ind.									L
Arrow Electric Company, Hartford, Conn.	f	sp	P	R	L	F			
Arrow Head. See Arrow Elec. Co.									
Beaver Machine & Tool Co., Dept. 10-R, Newark, N. J.	f	p	P				F		
Best. See United States Elec. Mfg. Corp.									
Brascolite. See Guth & Co., Edwin.									
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa.	f								
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.									L
Bryant Elec. Co., 1421 State, Bridgeport, Conn.	f	sp	P	R	L	F			
B. S. Co. See Bridgeport Switch Co.									
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.									F
Circle F. Mfg. Co., Trenton, N. J.	f		P		L	F			
Circle T. See Trumbull Elec. Mfg. Co.									
Connecticut Elec. Mfg. Co., Bridgeport, Conn.		p	P	R	L	F			
Crouse-Hinds Co., Syracuse, N. Y.									L
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee, Wis.			P						L
Diamond Elec. Mfg. Co., 1330 E. 16th, Los Angeles, Cal.									R
Diamond H. See Hart Mfg. Co.									
Dugle. See Bryant Elec. Co.									
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill.									F
Gaynor Elec. Co., Bridgeport, Conn.	f								L
General Elec. Co., Bridgeport, Conn.	f	sp	P	R	L	F			
G. E. See General Elec. Co.									
Glo-Guide. See Bryant Elec. Co.									
Gold Star Push Switch. See Hart & Hegeman.									
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo.									F
Hart Mfg. Co., Hartford, Conn.	f	sp	P	R	L				
Hart & Hegeman Mfg. Co., Hartford, Conn. (Door Bolt Control.)	f	sp	P	R	L	F			
Hart. See Hart & Hegeman Mfg. Co.									
H. & H. See Hart & Hegeman Mfg. Co.									
Hubbell, Harvey, Inc., Bridgeport, Conn.		sp				L	F		
Jost. See Morse, Frank W.									
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.	f		P						
Leviton Mfg. Co., 226 Newell, Brooklyn									F
Levoller. See McGill Mfg. Co.									
L. P. See General Elec. Co.									
McGill Mfg. Co., Valparaiso, Ind.	f						L	F	
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y.		s				R			
Morse Co., Frank W., 289 Congress, Boston, Mass.					P				
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago, Ill.							L	F	
National. See Standard Elec. Mfg. Co.									
New England. See Paulding, John L.									
Nutmeg. See Hubbell, Harvey, Inc.									
Operite. See Morse Co., Frank W.									
Pass & Seymour, Solvay Sta., Syracuse, N. Y.	f	sp	P			L	F		
Paulding, John I, New Bedford, Mass.	f	s	P						
Pen Tap. See Beaver Mach. & Tool Co.									
Perkins. See Bryant Elec. Co.									
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y.									L
Pilotoggle. See Pilot Elec. Mfg. Co.									
Pullrite. See Morse, Frank W.									
Roberts Elec. Mfg. Co., 211 Centre, New York, N. Y.									F
Rodale Mfg. Co., 200 Hudson, New York	p								
Sears, Henry D., 80 Boylston, Boston	f	sp	P	R	L	F			
Sho-Lite, Inc., Dept. R, 141 Merrimac, Boston, Mass. (Pilot Light.)	f								
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.					P				
Spartan. See Bryant Elec. Co.									
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill.	f	s	P	R	L				
Trigle. See Bryant Elec. Co.									

Make it a 100% appliance ~ ~ ~

by equipping it with the RIGHT *plug and cord set*

for—



721

Heaters,
Toasters,
Table Stoves,
Percolators,
Waffle Moulds,
Curling Irons,
Irons,
Fans,
Soldering Irons,
Drink Mixers,
Hair Dryers,
Vibrators,
Violet Ray Outfits
Lamps,

etc.

715

714

. . . it is probably true that the average purchaser of an electrical appliance doesn't look twice at the cord or the plug, BUT—he certainly finds out the difference in good and bad accessories after he has used the appliance awhile.

Everything about these HOOSICK FALLS cord sets, appliance and attachment plugs reflects the quality that goes into them; and yet they are not expensive. Look at item No. 715—here's an appliance cord set comprising a brown Rayon cord with a gold stripe; a brown appliance and attachment plug. It's a cord set worthy of the best made appliance.

If you wish quotations and samples—write us.

Hoosick Falls
Radio & Electrical Parts
Manufacturing Company, Inc.

Moulded Parts of
Quality Insulation

Hoosick Falls, N. Y.

732

720

751

739

730

750

738

QUALITY HOOSICK PARTS

Switches, Snap—Continued
Trumbull Elec. Mfg. Co., Plainville, Conn. f s P R L ..
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y. ..... f .....
Victor. See Kell & Son, Francis.
Weber. See Sears, Henry D.
Wood Electric Co., C. D., 565 Broadway, New York, N. Y. ..... F
Workrite. See Morse, Frank W.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Electric Co., Hartford, Conn.
Bryant Electric Co., 1421 State, Bridgeport, Conn.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman Mfg. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Penn Electric Machine Co., Des Moines, Ia.
Radioloc. See Cutler-Hammer Mfg. Co.
Sechrist Mfg. Co., Albert, 1717 Logan, Denver, Colo.

SWITCHES, Tank

Anderson Electrical Works, 212 W. Austin Ave., Chicago, Ill.
Automatic Appliance Co., 226 N. St. Clair, Dayton, Ohio.
Automatic Switch Co., 154 Grand, New York.
Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
Industrial Controller Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Penn Elec. Switch Co., 12th & Walnut Sts., Des Moines, Ia.
Sundh Elec. Co., 209 Parkhurst, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilboken Mfg. Co., 404 Grove, Milwaukee, Wis.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elecl. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 203 Lafayette, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brooklen Underground Elec'l Mfg. Co., Glenside, Pa.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Niagara Metal Stamping Corp., Niagara, N. Y.
Premax. See Niagara Metal Stamping Corp.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.

TANK SWITCHES. See Switches, Tank.

TANKS, TINNING. See Wire Manufacturing Machines.

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville, Inc., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;

Tape, Sleeving, Webbing.
Anchor Weobing Co., Pawtucket, R. I. Cotton, Silk.
Awebeco. See Anchor Webbing Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentape. See Belden Mfg. Co.
Eagle. See Sidebotham, Inc., John.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.
Hall & Carey Weaving & Belting Co., Lockport, N. Y.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald, Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Guscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Jas., Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Armature-White. See Boston Woven Hose & Rubber Co.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., P. O. Box 5077, Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okenite Co.

Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Evergrip. See Boston Woven Hose & Rubber Co.
Firestone Tire & Rubber Co., Akron, O.
General Elec. Co., Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holdfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Hyvolt. See Fielg Co., L. L.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville, Inc., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Lavelle Rubber Co., 320 W. Illinois, Chicago, Ill.
Magnet. See Boston Woven Hose & Rubber Co.
Manson. See Okonite Co.
Mystic. See Lavelle Rubber Co.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Relic. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Security. See United States Rubber Co.
Service. See Boston Woven Hose & Rubber Co.
Slipknot. See Plymouth Rubber Co.
St. Louis Rubber Cement Co., 3952 West Pine, St. Louis.
Star. See Sullivan & Sons Mfg. Co., J.
Sticka. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holdfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulator Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn.
Ridlon Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.

TAPS. See Stocks, Dies and Reamers.

TENSION DEVICES, Coil Wire. See Racks, Wire Reel.

TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS, Wire

All-in-One. See Ohio Parts Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dixie Supply Co., 91 7th Ave., New York, N. Y.
Fahnestock Elec. Co., cor. East Ave. and Eighth, Long Island City, N. Y.
Firth Radio Co., 25 Beaver, New York, N. Y.
Grammes & Sons., Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Mazda Radio Mfg. Co., 1330 E. 26th, Cleveland, O.
Morse Co., Frank W., 289 Congress, Boston, Mass.
Ohio Parts Co. (local), Cincinnati, O.
Orum, S. B. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Tinkerbox. See Weber Elec. Wks.
Waterbury Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sts., Cleveland, O.

TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Mfg. Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 N. Capitol, Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.

TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Company, 493 Clinton, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., G Dept., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co.
Century Electrical Co. 100 Randall Ave., Syracuse, N. Y.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 70th St. & Woodlawn Ave., Cleveland, Ohio.

Electric Machine Corp., 529 N. Capital, Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Forest Electric Co., 272 New, Newark, N. J.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 477 Broadway, New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kletzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Meco. See Metropolitan Mfg. & Elec. Co.
Metropolitan Mfg. & Elec. Co., 1163 Sedgwick, Chicago, Ill.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Oman, David W., Minneapolis, Minn.
Paneltest. See Forest Electric Co.
Portometer. See Forest Electric Co.
Portostat. See Forest Electric Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES

Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
Illinois Testing Laboratories, 149 W. Austin Ave., Chicago.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Stupakoff Laboratories, 6617 Hamilton Ave., Pittsburgh, Pa.

THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL

Briggs & Sons Co., J. Providence, R. I.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.
Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., Newark, N. J.

THERMOSTATS

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American Thermostat Co., 226 Jeliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bai-Rite. See Electric Appliance Mfg. Co.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 2 Lanesville Ave., Boston, Mass.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cramblet Engineering Corp., 286 Milwaukee, Milwaukee, Wis.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Federal Gauge Co., 564 W. Adams, Chicago, Ill.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
King. See Electric Heat Control Co.
Manhattan Elec'l Supply Co., New York, N. Y.
Marvel. See American Thermostat Co.
Moeller, A. E., 261 Sumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fruntenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Sensatherm. See Federal Gauge Co.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teepie Co., L. R., 540 E. 9th, Portland, Ore.
Thermosnap. See Spencer Thermostat Co.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Federal Gauge Co.

TIGHTENERS, Commutator

Elmes Engineering Works, Chas. F., 222 N. Morgan, Chicago, Ill.

TINNING TANKS, WIRE. See Wire Manufacturing Machines.

TINSEL. See Wire, Insulated.

TIPS, Cord

Alden Mfg. Co., 52 Willow, Springfield, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldentube. See Belden Mfg. Co.
Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
Na-Ald. See Alden Mfg. Co.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S., 415 Saunton, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Tinsel. See Wire, Bare.
Waterbury Brass Goods Corp., Waterbury, Conn.

TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Commutator Truing

Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1262 W. Fourth, Cleveland, Ohio.

TOOLS, Dies and Jigs

Aerial Machine & Tool Co., 79 Grand, New York, N. Y.

TOOLS, Storage Battery

Battery Equipment & Supply Co., 1638 S. Wabash Ave. Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Besco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
Cowie Elec. Co., 1823 Wyandotte, Kansas City, Mo. (Jar Lifting Pliers.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Ibsco. See Illinois Battery Steamer Co.
Illinois Battery Steamer Co., Peoria, Ill.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)

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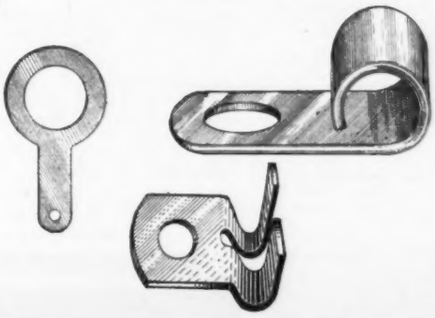
H. B. Sherman Mfg. Co.
Battle Creek, Mich.



To manufacturers using thermostatic metal—Coffin offers a most complete service....

IT is, naturally, to your advantage to procure blanks and special shapes in thermostatic metal from the concern that produces the metal. Here is that source—you are assured of not only the most sensitive and constant metal produced but of a uniformity in the quality of the shaped parts. And—you don't pay for any production waste.

Coffin also produces platinum and silver contacts—loose or staked in metal or screws.

The "Midget" Thermostat

Actual Size

THE "Midget" Thermostat is made especially for all appliances where low temperature control must be maintained with certainty. Made with pure platinum contact points.

Especially designed for electric heating pads, blankets and similar products.

Cross Sectional View

B·F·COFFIN MFG. CO.
30 COURT ST., NEWARK, N. J.

TOOLS, Storage Battery—Continued
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyrotip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES

Acetylene, Alcohol, Gasoline, Kerosene.
Berns Co., Otto, Newark, N. J.
Champion. See Lenk Mfg. Co.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Red Dragon. See Lenk Mfg. Co.
Staysalite. See Klein & Sons, Mathias.

TORPEDO Cord. See Twine.
TORSION BALANCES. See Instruments, Laboratory Standard

TRANSFORMERS

Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Oil Burner.

TRANSFORMERS, Low and Intermediate Voltage

Sorgel Elec. Co., 89 W. Water, Milwaukee, Wis.

TRANSFORMERS, Oil Burner Ignition

For Oil Burners and Gas Tube Signs.
American Bosch Magneto Corp., Springfield, Mass.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago,
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elecl. Supply Co., 17 Park Pl., New York, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power

Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.
TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel

Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.
TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.
Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Flexible Arms. See Tubing Flexible, Metallic.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Rubber. See Tubing, Rubber.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
British American Tube Co., 233 Broadway, New York.
Bull Dog. See British American Tube Co.
Chase Companies, Inc., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1395 Coltman Rd., Cleveland, O.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence.
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic

Almond Mfg. Co., T. B., Ashburnham, Mass.
American Metal Moulding Co., 146 Colt St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Metal Hose Mfg. Co., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
National Metal Molding Co., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

TUBES, Paper; Cores; Sleeves, Bushings

Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Straw Co., 38 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

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TUBING, Rubber

Rubber Tubing for Insulating Wire in Instruments and Telegraph Signal Lines.
Faultless Rubber Co., Ashland, O.
Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Tyler Rubber Co., Andover, Mass.

TUBING, Varnished Fabric

Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., Wm., 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Goodrich Rubber Co., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.

TWINE, Armature Winding; Torpedo Cord

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.

UNITS, Rods and Grids, Resistance

Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston,
Allen-Bradley Co., 493 Clinton, Milwaukee, Wis.
Automatic Electric Heater Co., 1505 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Burger, J. P., 1813 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Chromalax. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Daric Co., 35 E. 21st, New York, N. Y.
Despatch Oven Co., 120 1st Ave., N., Minneapolis, Minn (Space Heater and Oven Units.)
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill.
Elec. Controller & Mfg. Co., 79th and Woodland Ave. S., Cleveland, O.
Elemite. See Louthan Mfg. Co.
Farrington & Co., Inc., 28 W. Grand, Mt. Vernon, N. Y.
Fits-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Witlow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
Galvo Elec. Co., 1813 Columbus Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hexwound. See Monitor Controller Co.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2½ S. 20th, Philadelphia, Pa. (Radio Resistance.)
Ironium Products Co., 112 Hamilton, Cleveland, O.
Krischer's Mfg. Co., Colyer, Diamond and Newell, Brooklyn.
Leuthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
National Elec'l Supply Co., 1328 New York Ave., Washington, D. C.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 214 W. Ontario, Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Sepco. See Automatic Electric Heater Co.
Simplex Electric Heating Co., 85 Sidney, Cambridge, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.
United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waag. Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Weise Electric Co., 3217 Lisbon Ave., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

White Beauty Elec. Co., 4416 N. Western Ave., Chicago, Ill.
Wiegand Co., Edwin L., 422 1st Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.

VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated

Absolute Con-tac-tor Corp., Elkhart, Ind.
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., ft. of Tolman, Boston, Mass. (Water.)
Crane Co., S. Michigan Ave., Chicago, Ill.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
Jenkins. See Automatic Switch Co.
Liberty Electric Corp., Stamford, Conn.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 26th, Minneapolis, Minn.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Zisch Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-33rd St., Brooklyn, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore. (Gas.)
Victor. See Lunkenheimer Co.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)

VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works, Akron, Ohio.

WASHERS, FIBRE. See Fibre.

WASHERS, Leather

Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock

Kickhaefer Mfg. Co., 359 Reade, Milwaukee, Wis.
National Lock Washer Co., Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.

WASHERS, Metallic

Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Hubbard Spring Co., M. O., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.

WATTMETERS. See Instruments.

WAX AND COMPOUNDS

Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound .....See C
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago.... S ..
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S ..
Clifton Mfg. Co., 65 Brookside Ave., Boston..... C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... W S ..
Dielectric Mfg. Co., St. Louis, Mo. ..... W .. C
Dolph Co., John C., 168 Emmet, Newark, N. J. W ...
Ever-Protect. See National Cable Compound Co.
General Electric Co., Bridgeport, Conn..... W ...
Globe Chemical Co., Murray Road & Big 4 R. R. St. Bernard, Cincinnati, O..... W S ..
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich..... W ...
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
Insulatine Co., 1 Broadway, New York..... W ...
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind..... C
Minerallac Elec. Co., 1045 Washington Blvd., Chicago, Ill. ..... W ...
Mitchell-Rand Mfg. Co., 19 Vesey, New York.... W S C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind.... W ...
Nu-Blac. See Star Porcelain Co.
Ohmlac Paint & Refining Co., 140 S. Dearborn, Chicago, Ill. ..... W ...
Rubberseal. See Mitchell-Rand Mfg. Co.
Seldner & Enequist, Inc., 86 Hausman, Brooklyn, N. Y. ..... W ...
Sherwin-Williams Co., Cleveland, O..... W .. C
Standard Varnish Wks., 433 4th Av., New York.. W ...
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. ..... W S ..
Star Porcelain Co., Trenton, N. J..... W .. C
Tacrite. See Seldner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. ..... W S ..
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. ..... S ..
Zinsser & Co., 48 Vesey, New York, N. Y..... W ...

WELDS, Lamp Lead-in. See Filaments, Incandescent Lamp.

WELDING AND CUTTING OUTFITS

Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme. See Cushing Mfg. Co.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Corp., 726 Washington, Buffalo.
Alternare. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago.
Atlas. See Railway Track Work Co.
Automatic Trolley Guard Co., 65 Carroll, Buffalo, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.

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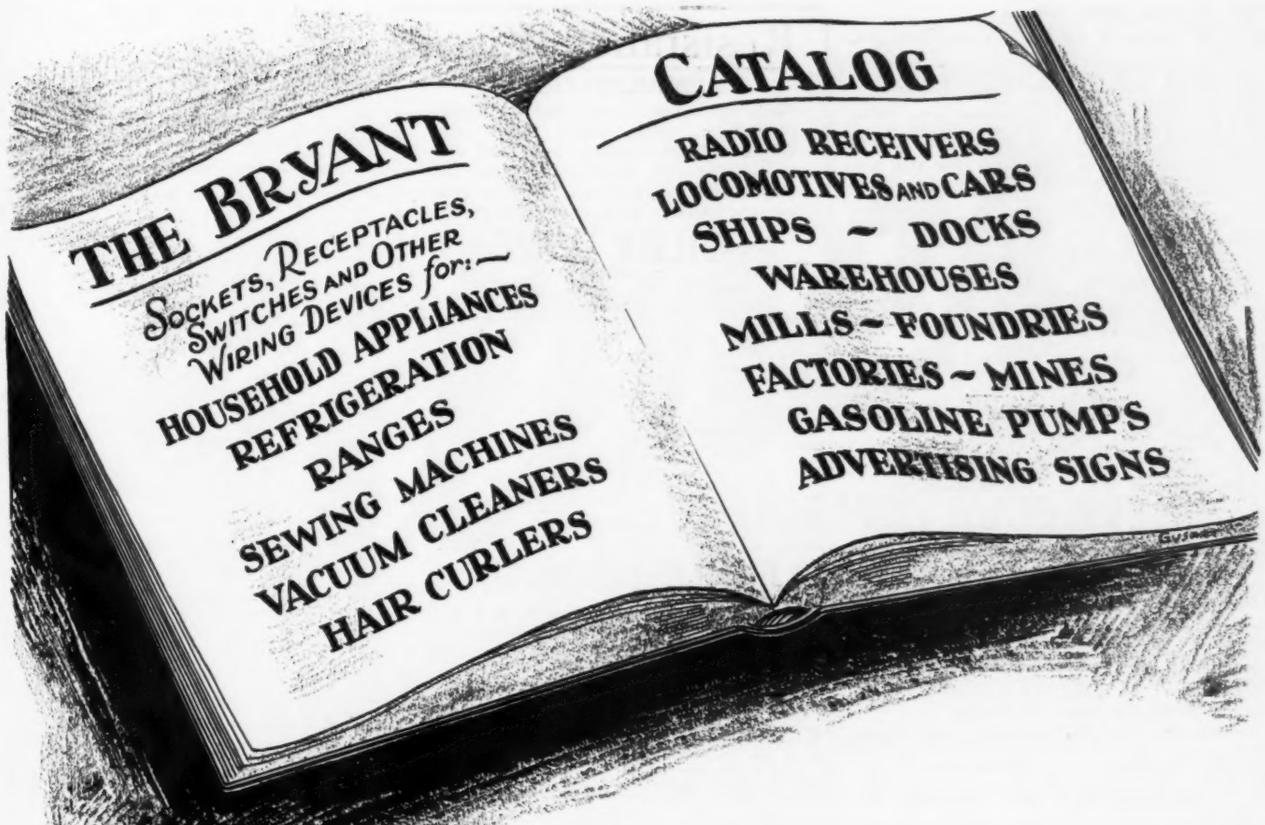

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Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Erico. See Electric Railway Improvement.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fuzon Welding Corp., 103rd St. & Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 169 5th Ave., New York, N.Y.
Gesco. See General Engineering.
Gibb Welding Machines Co., Bay City, Mich.
Hanson. See Northwestern Mfg. Co.
Indianapolis Switch & Frog Co., Springfield, O.
Lincoln Electric Co., Coit Rd. and Kirby Ave., Cleveland.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Plastic Arc. See Wilson Welder & Metal Co.
Railway Track Work Co., 3132 E. Thompson, Philadelphia.
Rail Welding & Bonding Co., 1615 Collamer Ave., Cleveland.
Ryerson & Son, Jos. T., 2558 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 1202 Maccabees Bldg., Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., Fort & Mt. Elliott, Detroit, Mich.
Taylor Welder Co., Warren, O.
Taylor-Winfield Corp., 12 Atlantic, Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Thordarson Electric Mfg. Co., 500 W. Huron, Chicago, Ill.
Toledo. See Thompson.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Welding Materials Co., 114 Liberty, New York, N. Y.
Weldrite. See Electric Welding Machine Co.
Wemco. See Welding Materials Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Winfield Elec. Welding Machine Co., 12 Atlantic, Warren, O.
Zeus. See Gibb Welding Machine Co.
WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.
Winding Forms. See Forms, Coil Winding.

WINDING FORMS. See Forms, Coil Winding.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Oman, David W., 34 Royalston Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Acme Products Co., 22 Elkins (S. B.), Boston, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Easton Coil Co., Easton, Pa.
Electrical Products Mfg. Co., Providence, R. I.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesona. See Universal Winding Co.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Ridlon Company, Frank, 253 A St., Boston, Mass.
Standard Radio & Elec. Co., Pawtucket, R. I.
Universal Winding Co., Boston, Mass.
Varley Duplex Magnet Co., 136 Seventh, Jersey City, N. J.
Weber & Scher Mfg. Co., 263 Sussex Ave., Newark, N. J.
Webscher. See Weber & Scher Mfg. Co.
Weehawken Elec. & Mfg. Co., 543 Gregory Ave., Weehawken, N. J.
WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

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WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Scrapers, Wire.
Strippers. See Scrapers, Wire;
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding	See S
Copper Wire	See C
Iron Wire	See S
Phosphor Bronze	See R
Radio Bus Wire	See C
Resistance Wire	See R
Steel Wire	See S

Acme Wire Co., New Haven, Conn. C
Advance. See Driver Harris Wire Co.
Airtram. See Radio-Electric Mfg. Co.
Alloy Metal Wire Co., Moore, Pa. C R
Alpha Radio Supply Co., 520 Broadway, New York C
American Brass Co., 25 Broadway, New York, N. Y. C R
American Copper Products Corp., 233 Broadway, New York, N. Y. C R
American Electrical Works, Philipsdale, R. I. C
American Fabric Co., 45 Baker, Providence, R. I. C
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago C S
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. C S
Anaconda. See American Brass Co.
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. C
Belden Mfg. Co., 2310B S. Western Ave., Chicago C S

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Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. R
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. C
Calido. See Driver Harris Wire Co.
Celatsite. See Acme Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromic. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. C S
Cornish Wire Co., 30 Church, New York, N. Y. C
Corwico. See Cornish Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. C
Cupron. See Gilby Wire Co.
Daron Mfg. Co., 101 Bradford, Providence, R. I. C
Detroit Insulated Wire Co., Detroit, Mich. C
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J. R
Electron. See Bassett Metal Goods Co.
Excelicier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.
Gilby Wire Co., Riverside Ave., Newark, N. J. R
Goldmark Co., James, 83 Warren, New York C
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) C
Hoskins Mfg. Co., Detroit, Mich. R
Hudson Wire Co., Ossining, N. Y. C R
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. C S
Indiana Steel & Wire Co., Muncie, Ind. S
Inland Wire & Cable Co., Sycamore, Ill. C
Ironium Products Co., 112 Hamilton, Cleveland, O. R
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C
Monarch Elec. & Wire Co. 622 W. Adams, Chicago C S
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 113 Orchard, Newark. R
Nehring Electrical Works, De Kalb, Ill. C
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. S
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. C
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I. C
Raco. See Ross Wire Co.
Radio Elec. Mfg. Co., 442 Clinton Ave., Newark, N. J. C
Roebling's Sons Co., John A., Trenton, N. J. C S
Rome Wire Co., Div. of General Cable Co., Rome, N. Y. C
Ross Wire Co., 69 Bath, Providence, R. I. C
Selcrimp. See Valley Narrow Fabric Co.
Seneca Wire & Mfg. Co., Fostoria, O. S
Silchrome. See Alloy Metal Wire Co.
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y. C
Standard Alloy Wire Co., Elizabeth, N. J. R S
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. C
Super-Insulated Wire Co., Plymouth, Mass. C
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hone Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn. C

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.

WIRE SOLDER. See Solder, Bar and Wire.

WIRE DRAWING MACHINES

Drawing and Re-drawing Mill Equipment for Small Wires.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Sleeper-Hartley, Inc., Worcester, Mass.
Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, Ohio.
Wire Machinery Corp. of Am., New Haven, Con.

WIRE, Insulated

	KEY
Annunciator, Office, Bell Wire	See A
Asbestos Covered Heater Cord	See H
Asbestos Covered Magnet Wire	See M
Enameled Magnet Wire	See M
Fixture Wire	See R
Flexible Reinforced Heavy Duty Cord	See F
Heater Cord	See H
Ignition Cable	See R
Lamp Cord	See R
Magnet Wire	See M
Rubber Covered Wire & Cable	See R
Stove Wire	See H
Telephone Cord	See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C. R

A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn.
Framaled Silk, Cotton M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Brass Co., 25 Broadway, New York, N. Y. A M
American Copper Products Corp., 233 Broadway, New York, N. Y.
American Electrical Works (Philipsdale), Providence, R. I. M
American Enameled Magnet Wire Co., Muskegon, Mich. M
American Fabric Co., 45 Baker, Providence, R. I. R F A T
American Insulated Wire & Cable Co., 954 W. 21st, Chicago, Ill. M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. R F A T
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda. See American Brass Co.
Ansonia Electrical Co., Ansonia, Conn.
Silk, Cotton, Enameled A M
Armoriokt. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston R
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill. R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. R F
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. R F H
Bradford, Kyle & Co., Plymouth, Mass. M
Cablex. See Collyer Insulated Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. R F H
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa. R
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. R F H A T M
Daron Mfg. Co., 101 Bradford, Providence, R. I. R
Davis-Jones Insulated Wire Co., Pawtucket, R. I. R F H A T
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R T
Diamond Braiding Mills, Chicago Heights R F H
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J. R H
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind. M
Durabilt. See Tubular Woven.
Duracord. See Tubular Woven.
Durawire. See Tubular Woven.
Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. F
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Garitt Mfg. Co., West Brookfield, Mass. T
General Asbestos & Rubber Co., Charleston, S. C. H
General Elec. Co., Bridgeport, Conn. R F H
Giant. See Collyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet A M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R T
Grimshaw. See New York Ins.
Habirshaw Cable & Wire Corp., 10 E. 43rd, New York, N. Y. R
Hatfield Rubber Wks., Inc., Hillside, N. J. R H
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa. R F A
Hercules Powder Co., Wilmington, Del. A M
Holyoke Co., 621 Broadway, New York. R A M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. R F H
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. R
Kilo, Co., 2 E. 23d, New York T M
Koelle, Frederic C., Real Estate Trust Bldg., Philadelphia, Pa. T
Liberty. See Nat. Metal Molding.
Lowell Insulated Wire Co., Lowell, Mass. R F H
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass. R T
Maring Wire Co., Muskegon, Mich. Cotton, Silk, Enameled M
Marion Insulated Wire & Rubber Co., Marion, Ind. R F H A T
Massachusetts Elec. Mfg. Co., West Lynn, Mass. M
Monarch Elec. & Wire Co., 622 W. Adams, Chicago, Ill. A
Montgomery Co., J. R., Windsor Locks, Conn. T
National India Rubber. See U. S.
National Metal Molding Co., 1135 Fulton Bldg., Pittsburgh, Pa. R F H A T M
N. E. See Goldmark Co., James.
New England Wire Co., Westfield, Mass. R H T
New York Insulated Wire Co., 114 Liberty, New York, N. Y. R
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co.
Okonite Co., Passaic, N. J. R
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O. R F
Parac. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. H A T

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. . . quality belts for more than a quarter of a century

A large, thoroughly modern plant, a fortunate combination of fine engineering and supervisory minds, and an impatience with anything short of the best have made the name Gilmer famous for highest quality belts throughout the industrial and automotive field.

L. H. GILMER COMPANY

Tacony, Philadelphia, Pa.

Gilmer moulded rubber and cord V-belts have such an amazingly long life—literally many times that of the average belt—because they fit the pulley with absolute accuracy. They are *tailored* to

fit. The entire area of their side surface grips and pulls. Gilmer belts are built directly in a mould —not squeezed into it. Fabric and rubber are scientifically placed to give maximum tensile strength.

Send for Folder "E" which fully describes Gilmer construction and moulded sizes which are now available.

"Cetec"

was the *first* cold molded composition in COLOR

ANTICIPATING the coming demand for color in cold molded insulation, we began long ago to offer "CETEC" to the industry in various colors.

Keeping always a step in advance of the growing use of color, we have increased the variety of colors and combinations, always seeking new applications and improvements.

We are still improving; and we suggest that, as the makers of "CETEC," and the pioneer in cold molded in color, we **know how** to get the best effects with the least experiment.

We probably have just what you are looking for, —if not, we'll see that you get it.

The CONNECTICUT MOLDED PRODUCTS CORP. *Meriden, Conn.*

WIRE, Insulated—Continued

Phillips Wire Co., Pawtucket, R. I. ..... R
Providence Insulated Wire Co., Providence, R. I. ..... R F H A
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Co., New Haven, Conn. R H T M
Roebling's Sons Co., John A., Trenton, N. J. ..... R F H A T M
Rome Electrical Co., Rome, N. Y. ..... M
Rome Wire Co., Rome, N. Y. ..... R F H T M
Ross Wire Co., 69 Bath, Providence, R. I. .. R
Runzel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill. ..... T
Safety Cable Co. (Div. of General Cable Corp.), New York ..... R F H
Salamander. See York Insulated.
Sewart Wire Co., Parkersburg, W. Va. R
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. ..... R F
Shield. See Ansonia Elec'l Co.
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. ..... H
Standard Insulated Wire Co., Westfield, Mass. ..... R H
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. ..... R
Strand & Sweet Mfg. Co., Winsted, Conn. ..... M
Super-Insulated Wire Co., Plymouth, Mass. ..... M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
Tip-Top. See Standard Underground.
Tirex. See Simplex Wire & Cable.
Trenchlay. See Rome Wire Co.
Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn. ..... R
Tubular Woven Fabric Co., Pawtucket, R. I. ..... R F
United States Rubber Co., 1790 Broadway, New York, N. Y. ..... R H A T
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. ..... M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. ..... R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. ..... R F H T
Whitney Blake Co. See Graybar Electric Co.
Wovenite. See Flexible Woven.
York Insulated Wire Wks. of G. E. Co., 120 Broadway, New York, N. Y. ..... R H M

WIRE, Steel Flat

Steel Coating for Armored Conductor.
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Crescent Insulated Wire & Cable Co., 319 N. Oden Ave., Trenton, N. J.
Roebling's Sons Co., John A., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.

WIRE MANUFACTURING MACHINES

(See Also Wire Drawing Machines; Insulation Mixers; Taping Machines, Wire; Wire Polishing Machines; Enameling Machines for Magnet Wire; Wire Wrapping Machines; Vulcanizers, Wire Insulation.)

Armoring Machines ..... See A
Braiding Machines ..... See B
Bunching Machines ..... See S
Covering Machines ..... See I
Insulating Machines ..... See I
Insulation Straining Machines ..... See I
Measuring Machines ..... See M
Park Cabling Machines ..... See A
Saturating Tanks ..... See F
Spooling Machines ..... See U
Stranding Machines ..... See S
Tinning Tanks ..... See F
Winding Reels ..... See U

I A B M S U F

Adamson Machine Co., Akron, Ohio.. I A
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A S U F
Breguet. See American Insulating Machy.
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. ..... M U
Housatonic Machine & Tool Co., Bridgeport, Conn. ..... I U
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. ..... M U
Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. ..... I A B M S U
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I
Sleeper & Hartley, Inc., Worcester, Mass. ..... A S U
Terkelson Machine Co., 326 A St., Boston, Mass. ..... M
Textile Machine Works, Reading, Pa. ... B
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn. ..... A U F
Utility Mfg. Co., Cudahy, Wis. I
Wardwell Braiding Machine Co., Central Falls, R. I. ..... B
Wire Machinery Corp. of Am., New Haven, Conn. ..... M S U
Weir. See Housatonic Machine

WIRE POLISHING MACHINES

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave. Philadelphia, Pa.
New England Butt Co., 324 Pearl, Providence, R. I.

WIRE STRAIGHTENING MACHINES

Kane & Roach, Syracuse, N. Y.
Shuster Co., F. B., New Haven, Conn.

WIRE TAPING MACHINES. See Taping Machines, Wire.
WIRE VULCANIZING MACHINES. See Vulcanizers, Wire Insulation.

WIRE WRAPPING MACHINES

Terkelson Machine Co., 326 A St., Boston, Mass.

WOOD BLOCKS. See Cabinets & Boxes, Wood.
Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.

WRAPPERS, Paper. See Boxes and Wrappers.
WRAPPERS, Tungsten Lamp. See Boxes and Wrappers.
WRAPPING MACHINES, WIRE. See Wire Wrapping Machines.

WRINGERS, Clothes

Anchor Brand. See Lovell Mfg. Co.
Arora. See Hart, Wallace B.
Chamberlain Machine Wks., Waterloo, Iowa.
Hart, Wallace B., 8 E. 34th, New York, N. Y.
Hercules. See American Wringer Co.
Lovell Mfg. Co., Erie, Pa.
Nevercrush. See Prima Mfg. Co.
Niagara. See Lovell Mfg. Co.
"1900" Washer Co., Binghamton, N. Y.
Prima Mfg. Co., 1612 Market, Philadelphia, Pa.
Riverside Photo. See Lovell Mfg. Co.
Safetee Wringer. See "1900" Washer Co.
Zenite Metal Co., 201 N. West, Indianapolis, Ind.

YARN AND THREAD; Silk, Cotton, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
Florsheim, H. A., 225 Fifth Ave., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Great Lakes Yarn & Thread Co., 5133 Wesson Ave., Detroit, Mich.
Johns-Manville, Inc., New York, N. Y. (Asbestos.)
Multiple Winding Co., 77 Summer, Boston, Mass.
Rich & Co., H. S., 180 S. Water, Providence, R. I.
Ryle & Co., Wm., 381 Fourth Ave., New York, N. Y.
Silkslip. See Worcester Bleach & Dye Wks. Co.
Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

ZINC

New Jersey Zinc Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

ZINCS AND COPPERS, Battery

Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Edes Mfg. Co., Plymouth, Mass.
Extruded Metal Corp., 184 53rd, Brooklyn, N.Y. (Zinc Cups.)
Franklin Graselli Chemical Co.
Horse Head. See New Jersey Zinc Co.
Illinois Zinc Co., Peru, Ill.
Lind Mfg. Co. 70 Wyckoff Ave., Brooklyn, N.Y. (Zinc Cups.)
Matthiessen & Hegeles Zinc Co., La Salle, Ill.
New Jersey Zinc Co., 160 Front, New York, N. Y.

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Over the top of the World *with* Wilson *Platinum-iridium* Contact Points

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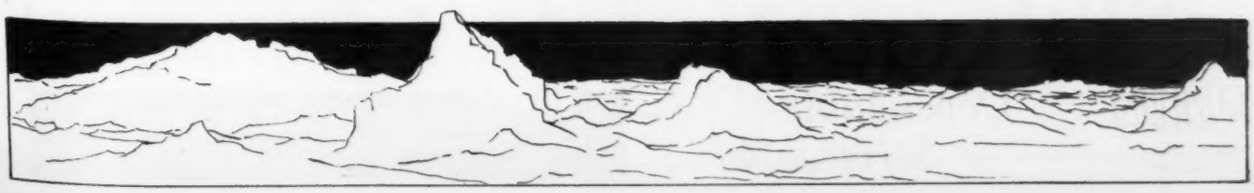
It was a Wright "Whirlwind" motor, equipped with a Scintilla Aircraft Magneto—and the pulse of that throbbing mass was two tiny WILSON Contact Points. Failure of these vital points would have spelled defeat; but as always, WILSON Contact Points came through without a miss, thus adding further proof of their sterling performance under the severest conditions.

The H. A. Wilson Company

Manufacturers of WILCO Thermostatic Metals Silver and Other Precious Metal Contacts

97 Chestnut Street . - Newark, New Jersey



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Garfield Molded Compositions

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Garfield Manufacturing Company

Established 1908

Garfield, New Jersey

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Economical
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Serviceable

Porcelava

The best for Electric Heating Appliances

Our clay specialties, plain and threaded tubes, and Refractory Porcelain for Electric Heating Appliances are superior in every way; and "PORCELAVA" makes the best Pyrometer Insulation.

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INSA-LUTE porcelain cement for assembling replaces . . . .

. . . . nuts, bolts and screws. INSA-LUTE is a liquid, porcelain cement—it will hold together any material with *permanent* rigidity. Its adhesive powers are far in advance of glue, paste and other insulating material. It is a perfect fireproof insulation.

Ideal Covering for Resistor Coils

Our engineering staff is at your service. Tell us what you make that we may supply samples.

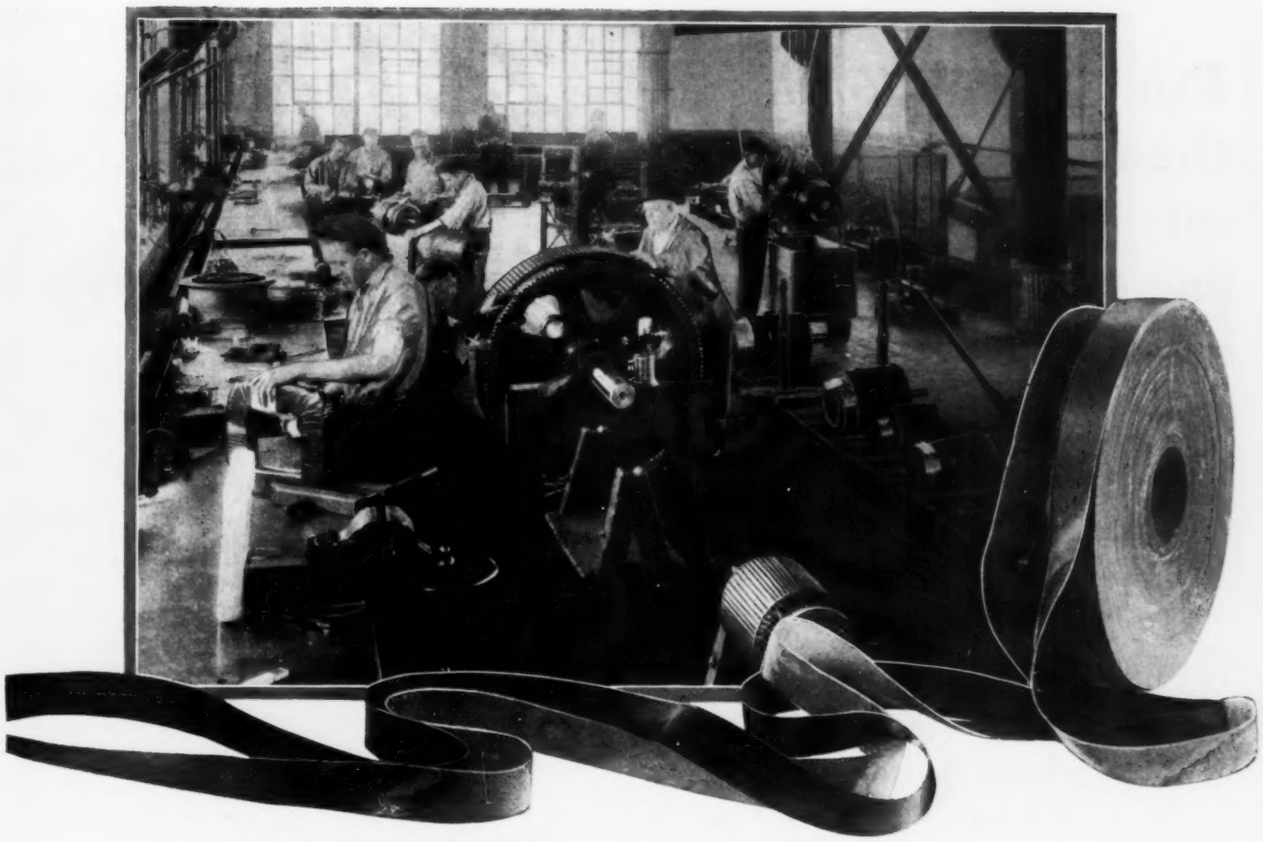
NEW

Fireproof contact without solder

Conductalute
Electric Conductive Paste

Conducts electricity without wires. A non-corrosive cold solder. Base for electric resistors. Prevents arcing at contacts.

TECHNICAL PRODUCTS COMPANY
Makers of INSA-LUTE Cement (liquid porcelain)
PITTSBURGH, PENNA.



Age resisting flexibility
under heavy loads and high temperatures

Wind the coils and bend the end turns to any desired radius—no matter how small—there is no danger of injuring the insulation when "Empire" oiled cambric is used. Run the Empire insulation right up to oil switch terminals on the generator and feeder panels—transformer and switch oils do not affect it.

"Empire" oiled cloths are outstanding in their practical advantages. Time and high temperatures do not impair the original pliable strength and the high initial specific resistance. It is truly "the age resisting electrical insulation."

Such qualities are not accidental. Modern methods of manufacture, the finest of raw materials and a craftsmanship of 35 years experience combine to maintain for "Empire" the leadership which it has enjoyed since it pioneered this type of insulation.

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PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

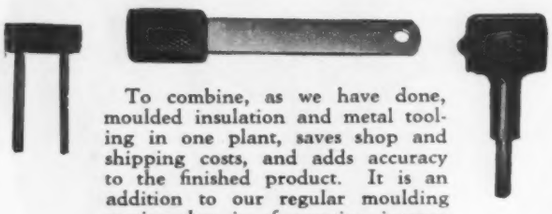
Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

Put them on *one* order *– and save time and money*

moulded *and* metal parts



To combine, as we have done, moulded insulation and metal tooling in one plant, saves shop and shipping costs, and adds accuracy to the finished product. It is an addition to our regular moulding service that is of genuine interest to you in lowering your production costs. Wasted time is lopped off, and quality is added, at lower price.

It is worth while investigating,—for a prompt quotation send your specifications to the "Estimate Dept."

Waterbury Button Co.
Waterbury, Conn.
The *complete* moulding service

24 hour production in BAKELITE MOULDING from *your* moulds

If you have volume articles, tell us what moulds you have and we will tell you what our 24-hour production will produce daily.

This 24-hour production cuts your mould cost in half on new articles on which a large daily production is required. It also cuts our costs to such an extent you can hardly afford not to have our prices.

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Our service costs you nothing. A trial will convince you.

Manchester Manufacturing Co., Inc.
Manchester Depot, Vermont

Uniformity

For over ninety-five years we have been making press board of unfailing quality.

Made to individual specifications Rogers Boards have found high favor among their users in the electrical industry because of their dependable uniformity.

Rogers Press Boards can be made to your requirements, too. We will welcome an opportunity to tell you how.

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ROGERS PAPER Manufacturing Co.
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HARD RUBBER

FOR all insulation purposes . . . . and wherever acid-proof and moisture-proof material is required.

Furnished in *rod, tube, sheet, and special radio panels* which conform to Bureau of Standards requirements.

Also *special turned and custom moulded parts* to your specifications.

Let us quote on your next requirements

The Vulcanized Rubber Company, Inc.
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Moulding *in* BAKELITE

Moulds?— We make our own

Our long experience as makers of moulds for the plastic trade gives us an important advantage in moulding to the most accurate specifications. We know our moulds are *right*, and the finished casting must correspond. Let us quote on your moulding needs, and send you a sample.

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502 Prospect Ave., Trenton, N. J.
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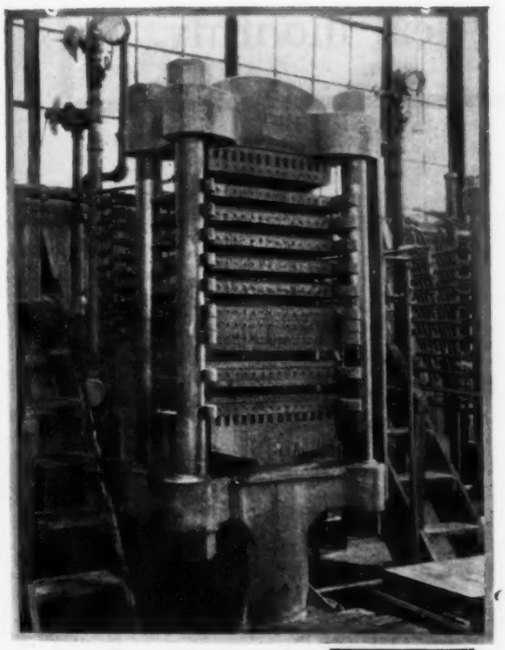
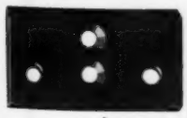
"The most efficient insulation we have ever used," says one electrical manufacturer — —

Fedrelin is efficient



240-ton multiple opening press. Steam-heated platens temperature up to 400° Fahr., compresses laminated sheets of paper or fabric.

Contact and tripping plates tooled and machined to the specification of a large elevator manufacturer.



because it is acid-resistant, moisture-proof—high in di-electric and mechanical strength.

For many years an elevator manufacturer has had difficulty in securing tripping and contact plates that would withstand the test of years.

FEDRELIN solved his problem and it has thoroughly proven its worth under severe usage.

FEDRELIN is a *permanent insulation* — it is acid-resisting — practically non-absorbent, and will not soften above machinery operating temperatures. It does not become brittle with age.

There are three grades—flexible, medium and hard—all are readily worked with tools.

FEDERAL INSULATING CORPORATION
Yonkers, New York

Fedrelin

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⚜ ⚜ ⚜ The largest paid circulation of any electrical monthly.

⚜ ⚜ ⚜ The fastest and most consistently growing *paid* circulation of any industry publication in the last year or over a period of four years.

⚜ ⚜ An increased paid circulation of over 50% in four years.

⚜ ⚜ Ratio of editorial to advertising pages is highest in electrical business press.

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⚜ ⚜ ⚜ The highest subscription rate of any electrical monthly. Industry pays over $20,000 more to read it than for any other publication.

Electrical Record

THE BUSINESS PAPER OF THE ELECTRICAL INDUSTRY SINCE 1892

The Beacon

guiding you straight to porcelain satisfaction

Porcelain buying is not a gamble or a matter of guess work if you specify or insist upon getting STAR Quality. Star Porcelain is real quality and yet the price is as low as some inferior kinds. Let STAR Quality guide you.

The STAR PORCELAIN COMPANY
TRENTON NEW JERSEY

We grew

until our old plant couldn't hold us:

THEN we moved into our new brick and glass plant in Akron, equipped with newest machinery for straight line production. Now we can serve an increasing clientele with Porcelain of Special Design, quicker, better and at favorable prices. This has not been a combine or sale—the same company still serves you in a new home under a new name. Your specifications for Special Porcelain will get prompt attention—send 'em right in.

—and we're still at it,
from now on, as
THE AKRON PORCELAIN COMPANY
Akron, Ohio
(Formerly the Mogadore Insulator Co.)

"QUALITY" SPECIAL PORCELAIN

Electrical—Refractory—Mechanical

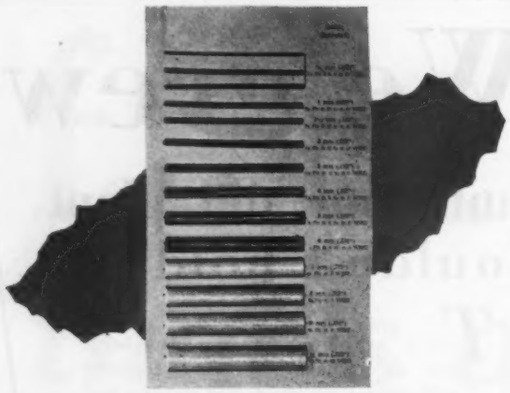
COLONIAL INSULATOR CO.
Established 1894 AKRON, OHIO

BEAD CHAIN *for* ELECTRIC FIXTURES

Dependability

From the standpoint of quality, uniformity, and prompt delivery, dependability has made Bead Chain the standard of the industry.

THE BEAD CHAIN MANUFACTURING CO.
BRIDGEPORT CONNECTICUT
Albert Lorsch & Co., Inc., Sales Agents
607 Fifth Avenue
New York City



MILES OF SPAGHETTI!

Sounds like a huge quantity!

ACTUALLY it represents only a day's output of the famous Turbo Oil Tubing from our factory.

Durable, flexible, and uniform, well describes Turbo Oil Tubing. It is made of the best quality materials and is thoroughly impregnated both inside and out—constructed to withstand the highest voltage.

Why not follow the lead of other manufacturers—adopt Turbo Oil Tubing? Just drop us a line for SAMPLE STRANDS and booklet which gives further details.

WILLIAM BRAND AND CO.

268 Fourth Ave., New York, N. Y.

Also makers of mica products, condenser paper, Turbo Filling Compound

Chicago St. Louis Detroit San Francisco Minneapolis

CASE BROTHERS

INCORPORATED

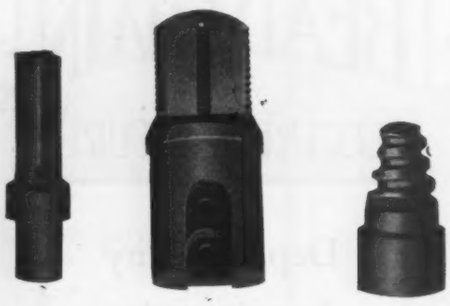
Highland Park, Conn.

Manufacturers of

Insulating Papers and Boards

Press Boards

Fuller Boards



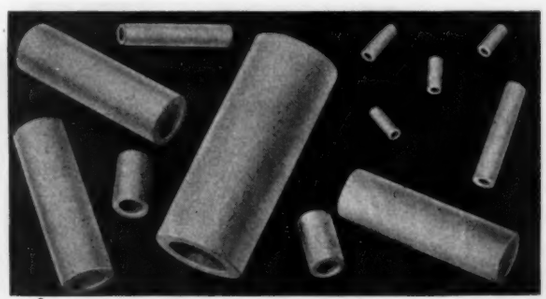
Lava insulators are unexcelled when incorporated in appliances requiring a fixed relation of their parts under all conditions. Lava is not subject to variations in structure and composition.

American Lava Corp.

1425 William St.

Chattanooga, Tenn.

Manufacturers of Heat Resistant Insulators



When you build the foundation of your house you use the best materials obtainable—

REFRACTORIES are the foundation of your appliance!

USE a product backed by years of research and experience. We offer today refractories unexcelled in density, strength of body and ability to withstand thermal shock.

Electric range plates—and other types of insulating supports—including Tubes or rods—made to your specification—guaranteed straight, clean cut, smooth and uniform.

We invite you to inspect our plant and use our staff of experts to solve your refractory problems.

The Electrical Refractories Co.
East Palestine, Ohio

Send for samples

"You can't afford to experiment."

Teamwork that Is

You can get it thrown in with your work—and why

YOUR job—demanding exceptional plant facilities, plus the real "know how" of great experience. Calling for imagination, initiative. A molding job requiring clocklike inter-department co-ordination from blueprint to casting—and more. A job to exact the most distinguished molding **service.**

We can handle it. Quickly, smoothly, accurately. Deliver it **right** and **on schedule.**

Molds, inserts, molding—leave them all to us. We can make your molds. We can make your inserts. You will be sure of them—your tolerances met. Sure of their being both right and ready on schedule. Sure of the molding starting on schedule. Sure that the first castings will be right, that all will be right—to get by our inspection.

You can pass the whole responsibility to us, and every smallest detail, every condition, will be taken care of. That including delivery when specified—in a hurry if required. International Insulating service is complete.

Steering wheel headlight control and horn button frames. Both complicated in design, nevertheless finished in one molding operation.

Molded connection plugs for electrical appliances are much stronger, add to salability, and retain their handsome polish.

New Uses, New Substitutions *for* Metal

You know about molding—certainly for various familiar purposes. Has it occurred to you to investigate it for **discoveries?**

Not a few of the oldest users of molding have been very much surprised at the remarkable expansion going on in its adoption in place of metal. Many frankly confess having overlooked its possibilities.

More and more uses for molding are constantly being found, in a great variety of lines of manufacture. Uses in many instances never before imagined possible, have completely replaced older materials and methods of production. Products molded complete, with metal inserts, in **one operation,** which it was not thought possible to mold at all. Eliminating expensive machining, fitting, assembling. Reducing unnecessary weight, improving appearance, dispensing with enameling, giving permanence of finish, adding beauty and meeting all requirements.

In electrical manufacturing especially giving more still, in insulation.

The advantages of molding may be an old story. But, nevertheless, there are new uses being found for it daily, and they are paying well for the investigating done. Paying in both reduced production cost and improved salability.

Again we say—what about investigating molding, really going into it, to check up your possibilities?

Our great experience is freely at your disposal, without obligation. We should be glad to study your products with you and supply figures.

Molded base of the Dulce-Tone radio - talking - machine speaker, with six threaded brass inserts imbedded. Finished complete when taken from the mold.

PRECISION MOLDERS OF BAKELITE AND SHELLAC COMPOSITION

INTERNATIONAL INSULATING CORPORATION

Division of The General Industries Co.

ESTABLISHED 1875 ELYRIA, OHIO

M&W Co.
LACQUERS
1876

AND LACQUER ENAMELS

Metal Lacquer No. 60

The *Permanent Protection* for Metal

Newly lacquered metal work looks bright and free from brown tarnish when it leaves your Finishing Department. How will it look *tomorrow, next week, next month* or *next year?*

Silver, Brass and other metals preserve their original color when protected with *Metal Lacquer No. 60.*

Write us for further information.

Maas & Waldstein Co.

Executive Offices and Plant
438 Riverside Ave.
NEWARK, N. J.

Chicago Office and Warehouse: **1115 Washington Blvd. West**
Los Angeles Office and Warehouse: **1212 Venice Blvd.**

What PRICE Lacquer?

Industrial users of lacquer must sometimes wonder just *what* they're paying for! Is it a "name"? Or perhaps "advertising"? Or "public demand"? Or is it lacquer?

If you're convinced that you're buying *lacquer*, then you know your own business enough to realize that your first question is: QUALITY? And your second question is: PRICE?

You hear many answers, but they vary only in the language used. They always claim—*best* quality!—*lowest* price! Then the conversation is apt to drift back to "name," "advertising," "public demand," or what have you?

But you're not buying answers. You're buying *lacquer*. So you sensibly *ask to be shown!* After all, you point out, you're paying—or *ought* to be paying—for lacquer!

Well, we agree with you—the efficient industrial buyer keeps his mind on *what* he's buying, and we want to get together with you on that basis! If you will describe your finishing requirements, we'll deliver you a formulated trial order that *you can test for the lacquer qualities most economical to your special production needs.* No talk. Just give it an unmerciful testing! Then we'll quote you a price. An honest-to-goodness price.

Zeller Lacquer Mfg. Co.

20 East 49th Street **New York City**

Stockrooms and Offices at
CHICAGO: 551 W. Lake Street
SAN FRANCISCO: 1039 Harrison Street
LOS ANGELES: 786 Ceres Avenue
DENVER: Ormor Sales & Supply Co., 503 Fourteenth Street, *Distributors*
WICHITA: Ormor Sales & Supply Co., 452 N. Main Street, *Distributors*

ZELLAC

ZELLAC

WAXES
for
Insulated Wires

Made to suit your Conditions
or Requirements
or to your Specifications

Our 33 years' experience
at your command

Special Waxes
for
Special Purposes

E. T. Trotter & Co.
576-602 Johnson Ave.
Brooklyn, N. Y.

M-R INSULATION M'F'G CO.

"Everything in Insulation"

Compounds, Waxes and Paints
Varnishes and Varnished Materials
Insulating, Waterproofing and
Maintenance Paints

Mitchell-Rand Mfg. Co., 19 Vesey St., N. Y.

"Candy's Faultless"

(True to name)

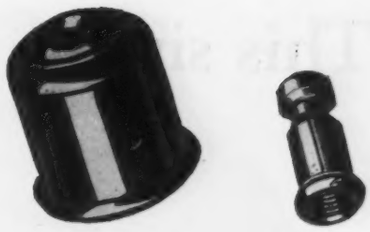
WAXES
INSULATING MATERIALS

for Rubber Covered and Weatherproof Wire, Coils, Condensers, Conduit, Wet and Dry Batteries, Wiring Devices, Sockets, Switchboards, etc. MATERIALS TO YOUR OWN SPECIFICATIONS OUR SPECIALTY. Compounds for Radio Parts.

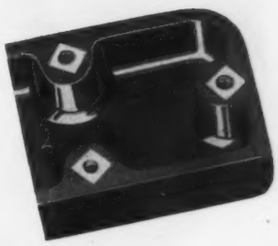
35 Years' Experience in Compounding

CANDY & COMPANY, Inc.
35th and Maplewood Ave., Chicago, Ill.

SCRANTON MOULDS



..the cradle of finer moulding



The beautiful finish—the accuracy and uniformity of Scranton moulded insulation—are made possible by the exacting care with which the moulds are made.

Realizing that to begin right is half the battle won, Scranton has for forty years insisted that the moulds —the cradle of Scranton moulding —be as perfect as skilled craftsmanship can produce. Then, when the finished casting comes forth, it requires the minimum of handling. Every Scranton mould produces uniform finish and precision, whether the order is for ten or ten thousand. That's what our customers expect of us—and get.

[[SCRANTON MOULDS]]

retained by them are always repaired, insured and renewed, if necessary, without additional expense.

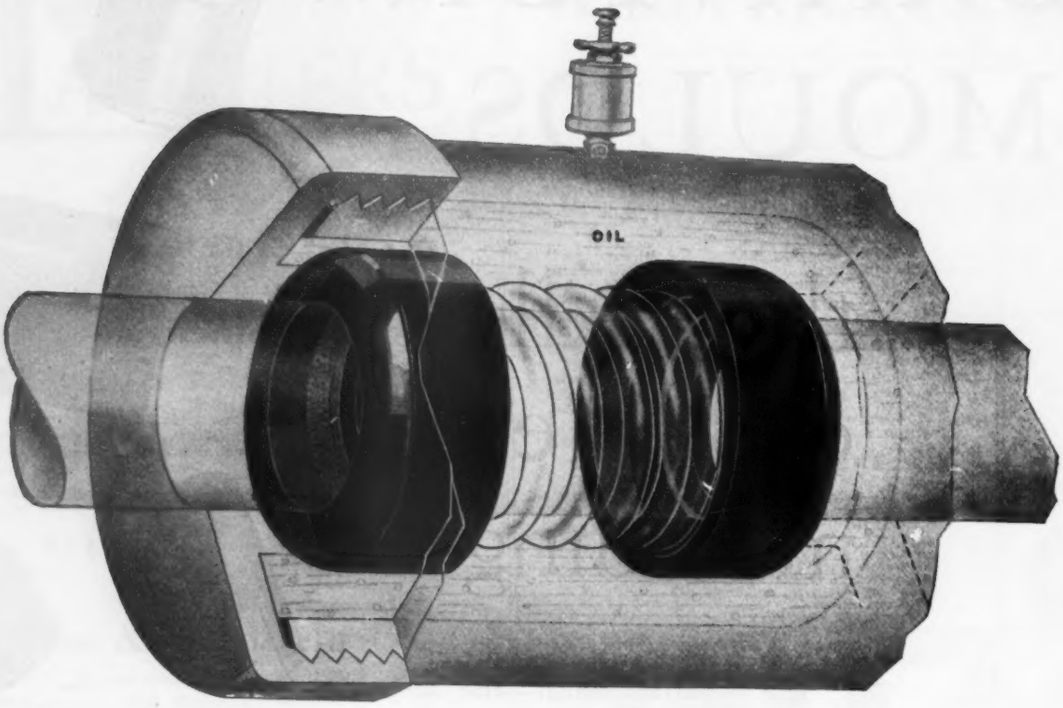
THE SCRANTON BUTTON CO.

Plants located at SCRANTON, PA., *and* AUBURN, N. Y.

NEW YORK OFFICE—50 *Union Square.*—CHICAGO—CLEVELAND

FORTY YEARS' MOULDING SERVICE TO ALL INDUSTRIES

This simple device improves two things:



(*a*) The efficiency of your product.

(*b*) Your dealers' morale.

Electrical goods dealers find from experience that as high as 40% of all service calls are traceable to *packing gland difficulties.* These service calls consume the dealers' time and money—this expense cuts their net profits deeply.

By adopting Cooke Seal Rings for their product many manufacturers of electrical equipment are receiving double benefits. That the adoption of this simple device makes a major improvement on their equipment is a proven fact—that it peps up dealers is a profitable result. The Cooke Seal Ring does away with stuffing box difficulties thereby allowing the dealer a cleaner profit and aiding him in keeping satisfied customers.

The Cooke Seal Ring, a simple mechanical device, wipes out forever packing gland difficulties. It reduces packing friction by 90%—reduces motor load, does away with scoring, hot boxes and wear on the shaft. It eliminates "oil throwing" on electric fans and motors. On washing machines, dishwashers or similar electrically-driven devices it prevents oil from leaking into the washing chamber or water from entering the motor. On refrigerating machinery it stops stuffing box trouble and assures a leakless joint which will hold either pressure or vacuum.

It's worth your while to investigate the Cooke Seal Ring. The coupon will bring you full data on sizes, types, and prices without obligation.

Mail it today.

COOKE Seal Ring

46 N. Green Street, Chicago, Illinois—Dept. B

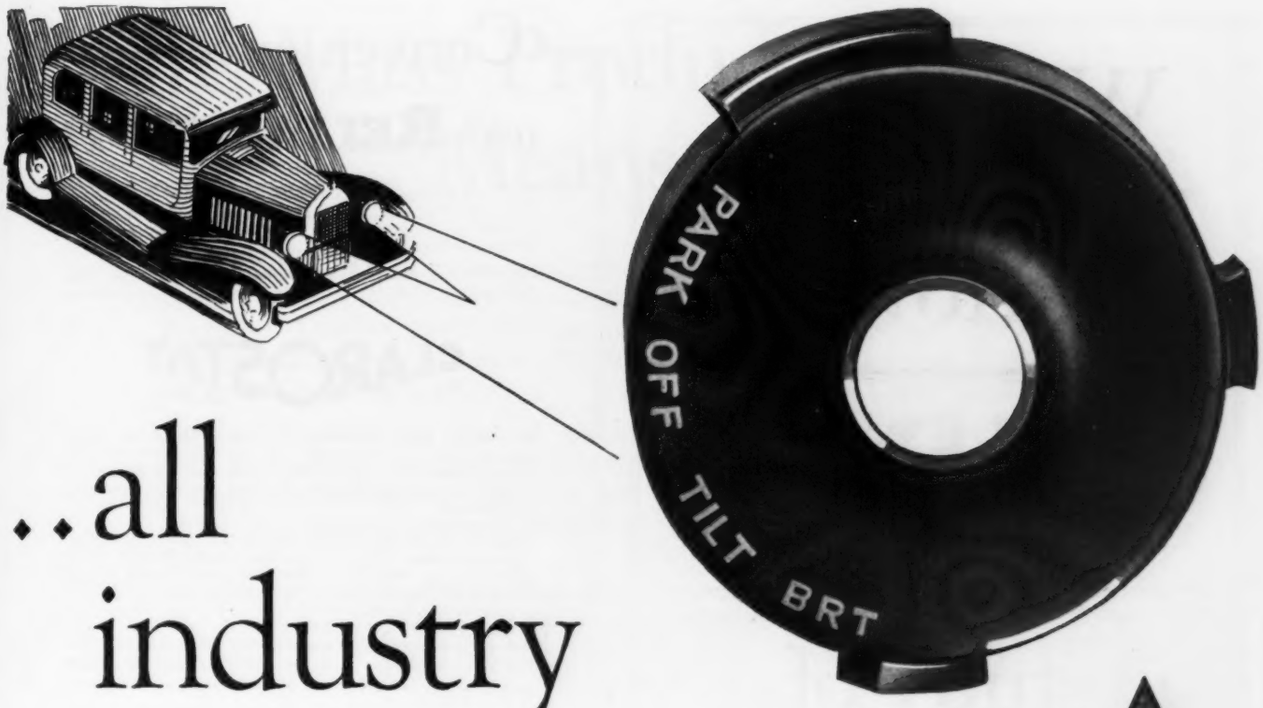
Cooke Seal Ring.
46 North Green St., Chicago, Dept. B.

Please send me your FREE booklet without obligation.

Name .....

Address .....

City .....State .....



..all industry comes to "AICO"

AICO

Molding that proves its right to be called an art

Experience that comes of broad service to all industry is at the beck and call of Electrical Manufacturers who want *better* moldings without paying a premium.

American Insulator Corporation

New York Office—52 Vanderbilt Avenue

Plants at New Freedom, Pa.—Danbury, Conn.

What every manufacturer ought to know:

COLLYER

makes a study of your cord requirements!

TYPE S. or S. J. (*all rubber*) for tough jobs

THE NEAT AND HANDY METAL SPOOLS for small cords

Collyer Insulated Wire Co.

Factory - Pawtucket, R. I.

Sales Offices and Stocks in All Large Cites

Convenience *with* RELIABILITY!

The convenience of variable resistance has never been questioned. Rather it has been a matter of reliability, for variable resistances have so often proved noisy, short-lived, and unreliable.

But today, you can have the *convenience* of variable resistance with the *reliability* of fixed resistance.

In the

CLAROSTAT Reg. U. S. Pat. Off.

you have both features. Used within its power rating, this device serves just as effectively as any wire-wound unit—with the enormous advantage of matching the resistance to the precise operating conditions.

There is a CLAROSTAT for every radio and electrical purpose, from the delicate radio circuit to the power pack and electrified set, and again to the fractional horsepower motor control and other electrical applications.

Let us co-operate with you on your resistance problems. We have the proper type now for your specific requirements, or we can make it. Shall we send our literature?

Be sure to see us at BOOTH 24 at the CHICAGO RADIO MANUFACTURERS TRADE SHOW

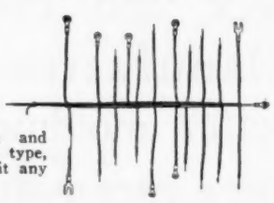
MEMBER RMA

American Mechanical Laboratories, Inc.

Specialists in Variable Resistors

285-7 N. Sixth St Brooklyn, N. Y.

Connect Via De Luxe Wiring Methods



We manufacture and form wire of every type, fitted or ready to fit any electrical device.

Our engineering staff is always ready to advise you on your wiring problems, whether they concern an intricate cable or a simple tinsel cord.

Manufacturers, in the electrical, automotive or radio line, will find our cooperation a great help in increasing the economy and efficiency of their products. Send us your specifications so we can submit samples and prices.

De Luxe

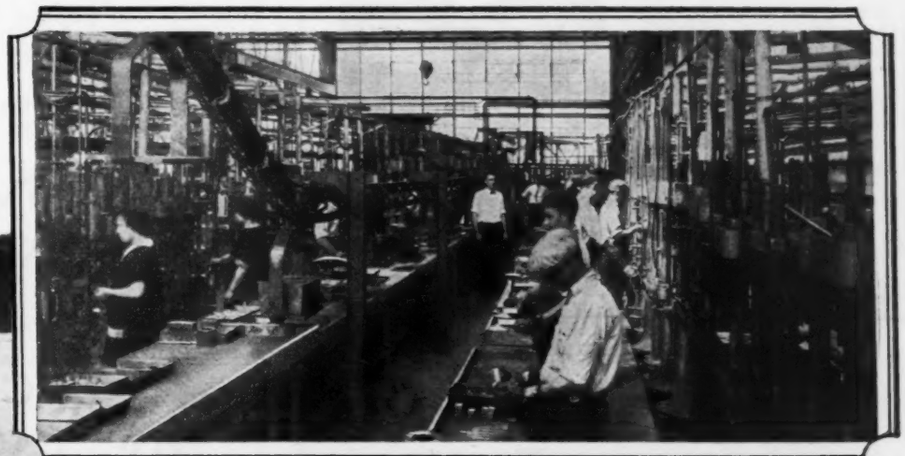
50 West Houston St., New York, N. Y.

This Mass Production Means Lower Costs

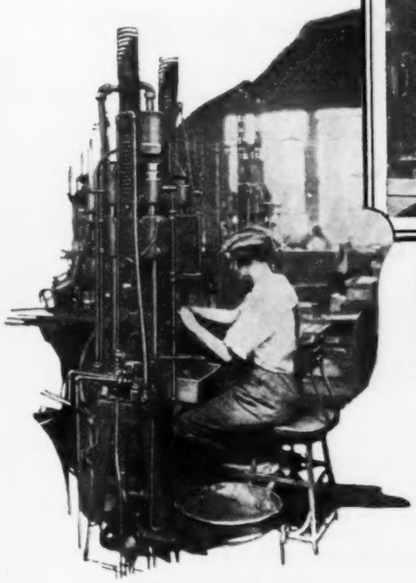
The facilities of G-E molding plants, which have produced millions of Textolite Molded parts for use in G-E products, are now available to the entire industry.

Careful research, the best of materials, and skilled design combine to produce superior molded parts at low cost. Five years of experience, in which G-E made more than 375,000,000 pieces, have brought production methods to highest efficiency. The resources of General Electric make these plants a dependable source of a high-grade product.

If you need custom-molded parts of proved reliability and economy, telephone your nearest G-E office.



A production aisle in the hot-molded department. Note that the most modern equipment is used to decrease manufacturing costs by scientific mass production



This trained operator molds thousands of intricate pieces every day. Hundreds of such operators are needed to meet the demand for G-E Textolite Molded

An aisle in the cleaning department. After cleaning, the beautiful polished pieces are ready for packing

GE Textolite Molded

885-12

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Your Coil Problem Solved!

Install a group of
"Universal"
Coil Winding
Machines
and insure
uniform production
of dependable coils
at surprisingly
low cost

or

Purchase these same coils from us, carefully wound to your specifications and ready for application to your product

UNIVERSAL WINDING COMPANY
Lesson
BOSTON

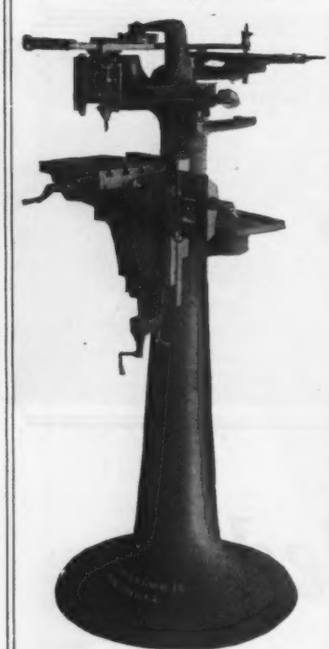
You may have a special metal problem which we can help you solve

There is usually one best metal for every manufacturing requirement. The American Brass Company, through its Technical Department, is prepared to help determine what this metal is, and if the need is met most advantageously with copper or an alloy of copper, to supply the metal in uniform, dependable quality.

THE AMERICAN BRASS COMPANY
General Offices ~ Waterbury, Conn.

ANACONDA COPPER
BRASS ANACONDA BRONZE

Keeping Up With Orders



The rapid strides being made in the ELECTRICAL field demand equipment capable of keeping up to the call for parts. The

GORTON Engraving Machine

stands out prominently on such work. Its rapid action, easy manipulation and unerring precision make it an invaluable tool on small engraving jobs. It is made in different sizes and styles, suited to a vast variety of work. Tell us what you make and we'll show you how to save in the making.

SEND FOR CATALOG

GEO. GORTON MACHINE COMPANY
Racine, Wisconsin

Automatic Metal Stampings

We specialize in brass and copper stampings. Write for our card of standard lugs, terminals and socket springs.

Send us your blueprints or samples for quotations on special work.

We also make a direct motor attached wire stripper that strips the insulation and twists the wires in a single operation. Send for our circular—or better yet—send us a few sample wires and we will show you what it can do.

Samples? -just write

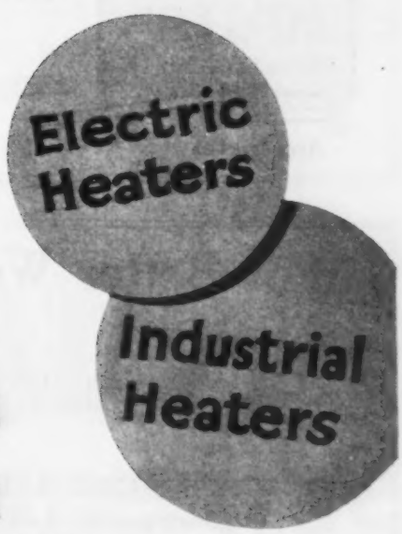
F. R. ZIERICK MACHINE WORKS
6 Howard St. New York, N. Y.

TRY US
and you will know why we are always busy on springs and screw machine parts. Quality and service our WATCHWORDS.
The Peck Spring Co.
Plainville, Conn.

THE WIRE WITH THE LONG ASBESTOS FIBRE

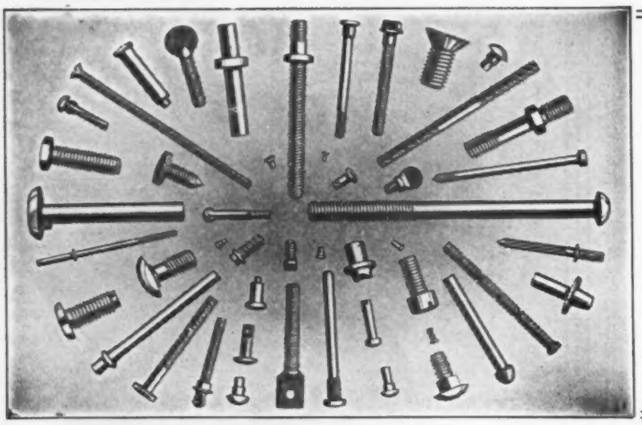
Deltabeston

The tough, long-fibered asbestos covering of Deltabeston makes it the ideal protection from the attacks of heat, twisting and general rough treatment. Deltabeston is a resilient wire that is flame-proof and practically strain-proof.



YORK INSULATED WIRE WORKS
OF GENERAL ELECTRIC CO.
120 BROADWAY NEW YORK

DELTABESTON WIRE



WHEN IN NEED OF

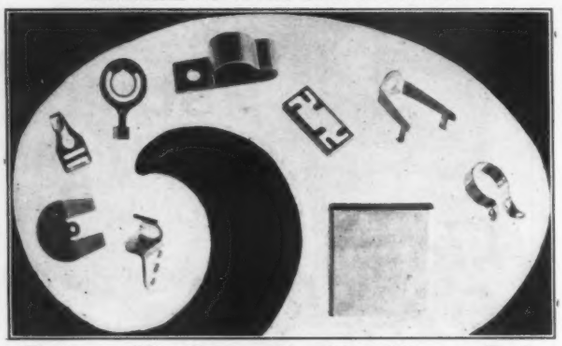
MACHINE SCREWS
MACHINE SCREW NUTS
SPECIAL STUDS
SPECIAL SCREWS

COMMUNICATE WITH
THE HOUSE OF SERVICE

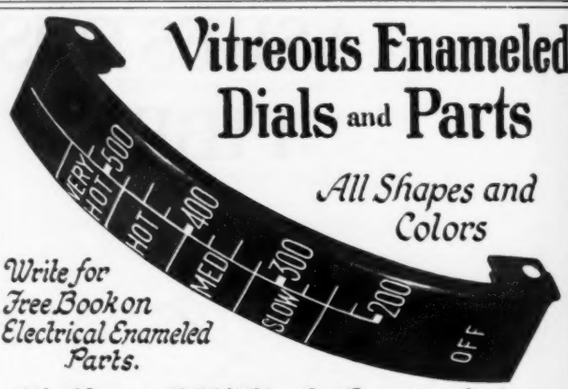
THE PROGRESSIVE MANUFACTURING CO.
TORRINGTON, CONN.

We please those discriminating manufacturers who not only demand quality but service as well. Business goes where it is invited and remains where it is well treated. The illustration reveals a few only, of the possibilities that are developed by the cold heading process.

A Good Place to Buy
SMALL METAL STAMPINGS



Patton - MacGuyer Co., Providence, R. I.



Vitreous Enameled Dials and Parts

All Shapes and Colors

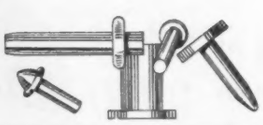
Write for Free Book on Electrical Enameled Parts.

The Horace R. Whittier Co. Pequabuck, Conn.

Cold headed products
Solid Rivets
Tubular Rivets

INSERTS
FOR
MOULDERS

Any metal

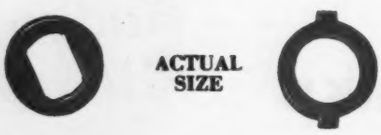


WASHERS "Specialists in the Electrical Field"

For Thirty Years, Designing and Making Washers.
Also Small Stampings

THE QUADRIGA MFG. COMPANY
213-221 WEST GRAND AVENUE, CHICAGO
IF IT'S FOR STEADY PRODUCTION WE ABSORB DIE COSTS

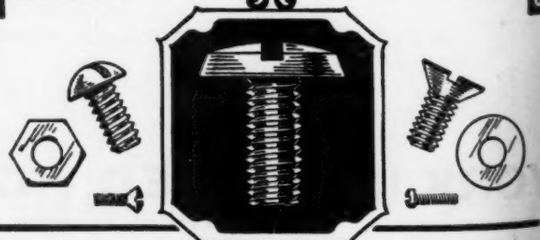
For Better Washers



ACTUAL SIZE

OF BRASS, STEEL AND COPPER
Highest quality—Low prices
Write Us

MASS. MACHINE SHOP, INC.
BOSTON, MASS.



All kinds of Electrical Screws carried in stock
WRITE FOR PRICES

NEW ENGLAND SCREW CO.
DEPT. A
44 FARNSWORTH ST. BOSTON, MASS.

IF YOU LIKE YOUR
RAW MATERIAL
WELL DONE
STANDARDIZE
FOR YOUR
ELECTRICAL
REQUIREMENTS
ON
WEBER WIRING DEPENDABLE DEVICES
STANDARD FOR QUALITY SINCE 1895
SEND FOR CATALOG
HENRY D. SEARS
General Sales Agent
80 BOYLSTON STREET
BOSTON, MASSACHUSETTS

Rome Electrical Company, Inc.
Manufacturers of
Twin, Round, Flat and Square
MAGNET WIRES
Cotton, Silk, Asbestos and Enamel Covered
Write for Prices
ROME NEW YORK

Precision Work plus Timely Service
METAL PRODUCTS
Wire Forms
Metal Stampings
Machine Screws
Battery Connectors
Screw Machine Products
Clark Metal Products, Inc.
490 Hancock Avenue
Bridgeport Conn.

LONG service, greater physical strength and electrical perfection—these insure a wire that assumes responsibilities and gives service.

MARING Sales Engineering Service is maintained to serve you. Our representatives are schooled by book and practice to know just what magnet wire you need to do the required job. Nine conveniently-located branch offices throughout the country will carry this message to you.

We are proud of this statement and our ability to back it up—"The Nation's Finest Value in Enameled, Cotton and Silk Covered Magnet Wire."

MARING WIRE COMPANY
MUSKEGON, MICH., U. S. A.

MARING Magnet Wire

"Straws tell which way the wind blows!"

THAT old adage has truer significance today than ever before in the history of business. Electrical manufacturers who are awake to the rapidly changing program governing our export business will be quick to see "which way the wind blows" in the following *news*:

Down in Buenos Aires there is nearing completion one of the greatest power plants in the world. The Compania Hispano Americana de Electricidad occupies an area 1,404,000 square feet. Its turbine room is 858 x 118 feet—the boiler room, 924 x 175 feet and with a ceiling 112 feet above the floor.

This company will operate 12 giant turbines of 75,000 hp. each—*nearly a million combined horse power*, producing 2,000,000,000 kilowatt-hours yearly.

And then, nearby this great plant another building operation is going on—$20,000,000 is being spent to increase 50,000 hp. to 300,000 hp. capacity.

Now you can better visualize the extent of a vast market for everything electrical—they're going to need *some* devices and appliances to harness and use 2,000,000,000 kw-hrs. That's the direction your wind is blowing.

Argentina is only one of the 20 great and rich Latin-American Republics *thoroughly* covered by ELECTRICIDAD EN AMERICA. Each of these republics is developing electrically in its own marvelous way, offering a potential market that beggars description.

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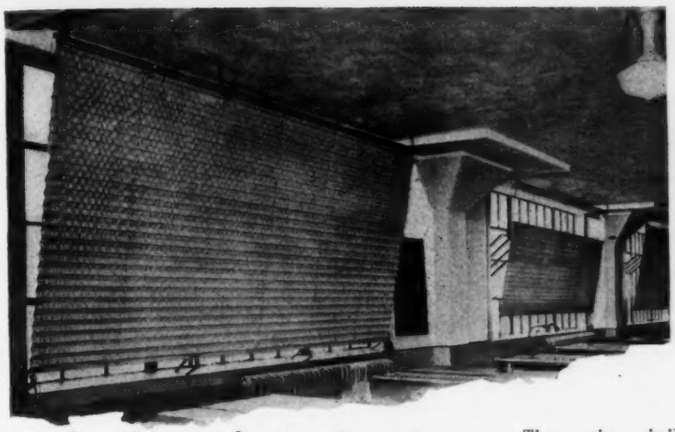
Electricidad en América

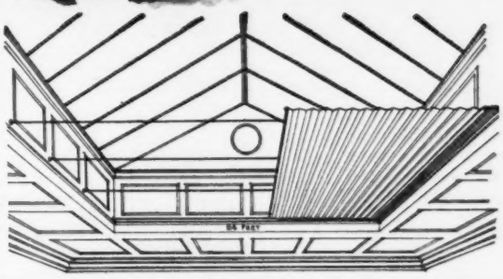
The only electrical export paper printed entirely in Spanish

Published Monthly by GAGE INTERNATIONAL PUBLISHING CORP., 461 Eighth Avenue, New York, N.Y

Athey Window Shades

Ideal for Electrical Manufacturers





The only skylight shade which entirely disappears, giving full volume of light on cloudy days and a translucent light under Sun's rays. Made in any size up to 16 ft. x 30 ft.

Regardless of the type of window or size up to 16 ft. in width, ATHEY Shades may be instantly adjusted to shade any part.

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One large concern uses the Athey Shade in 27 factories.

It is also used in several thousand schools and hospitals, banks and other buildings.

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Buy special springs from spring specialists. LEE-BUILT springs are as *sure* in your equipment as a bonded employee in your organization. It is important that you have yourself placed on the list to receive "Spring Data"—regularly issued.

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The ONEIDA Flexible Coupling is a simple device, but one that means a great deal to the life of oil burners, electric washers, refrigerators, ironers, etc. Sudden starting overloads, the backlash of stopping, and vibration are all absorbed by this perfect flexible coupling. It's a shock-absorber that you need on your appliance for the greatest serviceability. We are ready with details and prices whenever you want them.

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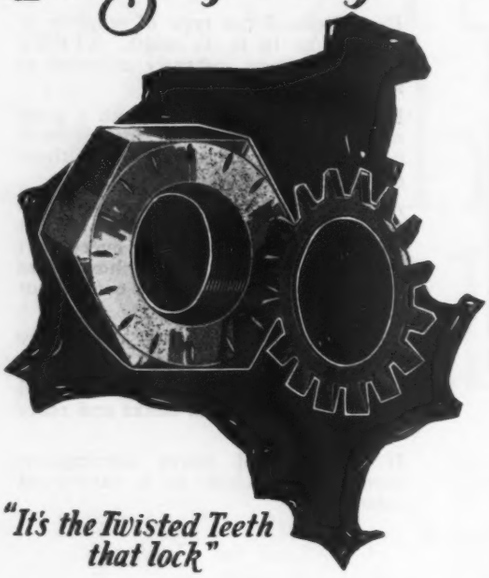
for *every* direct-connected appliance

DELBEE RUBBER CO., Inc.
Syracuse, N. Y.

Multiple Locking-Tangleproof!



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Multiple Locking Means Multiplied Satisfaction

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A few *The* PERMANENT INSULATION Carboloid *uses*!

An *unequalled* electrical insulation, and .....a *small* amount does a *big* job.

IMPREGNATING wood, fibre, paper, fabric, etc., are only a few of the many uses for CARBOLOID.

Paper, fabric or like substances impregnated with CARBOLOID and pressed or moulded, produces a **permanent insulation.** Such insulation will not become hard or brittle with age. It is easily shaped into any form or size, always maintaining a high dielectric and mechanical strength. Readily worked without damage to tools—threaded—sawed—drilled—tapped—punched or machined with facility.

All substances treated with CARBOLOID can be made thick or thin—hard, soft or brittle.

Wood impregnated with CARBOLOID is increased 70% in strength; waterproofed and maintains a high insulating value.

CARBOLOID may be had in three grades, hard—soft—medium, all three are miscible, so that any desired consistency may be obtained—without the use of solvents.

It is economical to use—**a small amount does a big job**—a few ounces of CARBOLOID gives better results than 10 or 12 lbs. of some of the oil pitches.

100 H.P. inductor impregnated and held together with CARBOLOID.

Coil impregnation

CARBOLOID hardened in a coil has an extremely high resistance to vibrations and mechanical shocks, and sufficient give and take to prevent undue stresses. It penetrates thoroughly, holding together the windings as no other compound does.

Cold impregnation under vacuum pressure is used—no solvents necessary. The coil is then baked at a temperature of 100 degrees centigrade.

CARBOLOID cures as a solid mass uniformly throughout—no bubbles or blisters—a clean cut finished job. No polishing or chipping required. Withstands heat to 360° centigrade.

Carboloid Products, Inc.

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Fifth—Definite dollars and cents savings are made by the manufacturer, the wholesaler and the retailer.

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309 Decatur Street Sandusky, Ohio

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